pp. 239–316] [April, 1940

TROPICAL DISEASES BULLETIN

VOL. 37.] 1940. [No. 4.

Main Contents :

SUMMARY OF RECENT ABSTRACTS.

III. MALARIA (*concluded*).

THE TYPHUS GROUP OF FEVERS.

BARTONELLA INFECTIONS,
DENGUE AND SANDFLY FEVER.

CHOLERA.

MALARIA.

HELMINTHIASIS.

BERIBERI.

For detailed Contents see pp. ii, iv, v & vi.

IMPERIAL MYCOLOGICAL INSTITUTE
29 APR 1941

Issued under
the Direction of the
Honorary Managing Committee of the
BUREAU OF HYGIENE AND TROPICAL DISEASES,
Keppel Street, London, W.C.1.

Price 2/6 Net.] *Entered as Second Class Matter in the U.S.A. Post.* [Annual Subscription 21/-, With Supplement 25/-.

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BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

Vol. 37.] 1940. [No. 4.

SUMMARY OF RECENT ABSTRACTS.*

III. MALARIA.

[continued from p. 171.]

Treatment.

General.—The general conclusions from the work of the year under consideration appear to be that there is little difference between atebrin and quinine in eliminating schizonts and reducing temperature; that short courses with moderate doses are efficient for the immediate attack, but allow a considerable proportion of relapses unless followed, after a period of a few days, by a course of plasmoquine. The sulphonamides have not been found efficient enough to replace these drugs.

The state of immunity in relation to treatment is discussed by SIMEONS (p. 686), who points out first that the injection of a powerful parasiticide, in a primary infection, reduces the parasite count so suddenly that the body is not called upon to produce immunity, and the unchecked multiplication of residual parasites soon recommences. Oral administration of atebrin gives better results than injections which, in the author's experience, allowed a relapse rate of almost 100 per cent. He further argues that in highly endemic areas a high degree of immunity already exists and that treatment should be adjusted to the immune state of the population concerned. WILSON (p. 126) develops this point of view in dealing with African natives. The only treatment necessary in hyperendemic areas is that required to afford protection to infants and children. This should not be enough to interfere with the acquisition of immunity, and in older persons the presence of a few parasites is not in itself an indication for treatment. On the other hand non-immunes, for example schoolboys or prisoners entering hyperendemic areas, require special attention including the provision of mosquito nets. RUSSELL (p. 130), however, in an area in which 55 per cent. of infants were found to be infected at a single blood examination, makes a practice of giving quinine to all children brought for treatment, although only 12·6 per cent. had temperatures of 100°F. or over.

DECOURT (p. 498) notes that the action of antimalarial drugs is complex, and describes their dysgonic action under the influence of

* The information from which this series of summaries has been compiled is given in the abstracts made by the Sectional Editors in the *Tropical Diseases Bulletin*, 1939, Vol. 36. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

which schizonts lose almost entirely their powers of asexual reproduction and of gametocyte formation. This action is manifested by the absence of morbid phenomena in spite of the presence of schizonts in the blood [but is this not characteristic of the immune state ?]. The dose of quinacrine necessary to produce this action is variable at the beginning of treatment, but the optimum dose necessary to sustain it when once established is about 0·25 gm. for an adult. Dysgonic action lasts about 3 weeks and if the parasite is only slightly aggressive a dose taken twice a month is enough to prevent all morbid phenomena. A small daily dose is less potent than the optimum dose taken at longer intervals, and there is no relationship between the curve of dysgonic action and the concentration of the drug in the blood or tissues.

MOLLARET and SCHNEIDER (p. 817) have studied the action of rhodopraequine in induced *P. vivax* malaria and after a dose of 0·03 gm. daily for 3 days. The temperature falls and schizonts and gametocytes disappear, but parasites reappear if subsequent auto-haemo-injection is given. These schizonts are well developed but show no tendency to segment or to leave the red cells, but the further development of gametocytes is not prevented. If blood containing these inhibited schizonts is inoculated into another person the schizogonic capacity of the parasites is regained. This is apparently the dysgonic action referred to by DECOURT (above).

A number of authors have compared methods of drug treatment. CIUCA and his colleagues (p. 11) consider that, for the treatment of attacks of malaria, quinine hydrochloride, atebrin and acriquine are therapeutically equal. Doses should be not less than 1 gm. quinine or 0·3 gm. atebrin daily and the length of treatment not less than 7 days. Mixtures of schizonticides are not recommended and a mixture of atebrin and plasmoquine should be avoided [but see MACMAHON below]. Atebrin followed by plasmoquine is the most efficient remedy in preventing relapses of quartan and subtertian malaria, and plasmoquine 0·02 gm. every 5 days is enough to devitalize *P. falciparum* gametocytes. Atebrin is not tolerated by children under one year of age. In a series of 269 cases, CIUCA *et al.* (p. 924) found that quinine and atebrin, whether combined with plasmoquine or not, did not prevent the appearance of gametocytes in 149 instances. On the other hand a single dose of 0·02 gm. plasmoquine was effective in eliminating gametocytes, and the authors advise that this dose should be given 3 or 4 days after the completion of the course of schizonticidal drugs and repeated, as stated above, every 5 days.

Opposing the view that the simultaneous administration of atebrin and plasmoquine appears to aggravate the toxicity of each, MACMAHON (p. 259) states that in his hands this method has given incomparably better results than any other form of treatment. Since, however, these drugs should only be given on a full stomach, he first treats his patients with quinine until food can be taken. The infections were mainly by *P. falciparum* and more than 75 per cent. have had no recurrence. In Greece, LIVADAS *et al.* (p. 397) conclude that combinations of quinine and plasmoquine or of atebrin and plasmoquine are especially useful. Atebrin has the quickest action on fever and in causing the disappearance of schizonts. Plasmoquine alone is the least efficient as a febrifuge but is the only drug which will destroy gametocytes of *P. falciparum.* Quinoplasmin is the most active in the reduction of splenomegaly and in preventing relapse, but quinine is more effective

than the synthetic drugs in causing an increase of red cells and of their haemoglobin content.

Quinine.—In *P. vivax* infections, BOYD and KITCHEN (p. 497) found that 11 grains of quinine administered on a single day suppressed paroxysms and induced periods of clinical quiescence of varying durations. Nothing comparable with this occurred in *P. falciparum* infections even after a dose of 20 grains.

The findings of the Malaria Advisory Board of the F.M.S. (p. 128) indicate that totaquina, type II, is as effective as quinine and only half as expensive. Paludex was not found to be satisfactory with the local strain of *P. falciparum.* Malarene, a proprietary preparation stated to contain the amorphous alkaloids of cinchona, was found by GUEST (p. 397) to be inferior to quinine in controlling fever and eliminating parasites. LENTJES (p. 923) used hydrochloride of hydroquinine, 0·6 gm. daily (in 3 doses) for 7 days, in 262 fresh cases of benign tertian malaria, and regards it as superior to quinine.

Agranulocytosis apparently due to quinine is reported by FAIGUENBAUM (p. 497), and HAUER (p. 923) gives details of an instance of inherited quinine hypersensitivity.

Comparing the results of treatment of *P. falciparum* infections with quinine sulphate and with quinoplasmin or plasmoquine co., KALMUS and KOSTIĆ (p. 263) found a much lower proportion of both early and late relapses with the latter combinations. GENTZKOW and CALLENDER (p. 257) in Panama found that quinine, in the rather large doses employed, was somewhat more effective than atebrin in preventing *P. vivax* relapses, and markedly more so in *P. falciparum* infections. Plasmoquine with or without atebrin has a pronounced effect upon the relapse rate of all forms, especially *P. vivax.*

Atebrin and plasmoquine.—GORBITZ (p. 257) considers that from all points of view atebrin is to be preferred to quinine as a schizonticide since it is tolerated better and gives rise to less important subjective symptoms. BOCK (p. 924) describes the morphological changes undergone by parasites during atebrin treatment. The drug apparently acts directly on the parasites.

SIEGENBEEK VAN HEUKELOM and OVERBEEK (p. 258) treated a series of patients with two intramuscular injections of atebrin, 300 mgm. each, followed by atebrin by the mouth, starting 5 days after the last injection. Immediate results were good, and early relapses few. They point out that in patients with jaundice or with damaged livers atebrin should be given with caution. Intoxication is more frequent after injection than after oral administration and injections are not suitable for mass treatment. FIELD *et al.* (p. 498), in an extensive trial, found atebrin musonate to be effective in controlling acute attacks of the three forms of malaria. It has, however, no advantage over quinine against gametocytes of *P. falciparum* and is not suitable for routine treatment, for which the method of choice is by drugs administered orally.

KEKHCHER (p. 259) reports an early relapse rate of 25·9 per cent. in tertian fever treated with acriquine; the drug is well tolerated. MALYCHEVA (p. 785) found fewer late relapses in patients receiving acriquine in three periods (5, 3 and 3 days) separated by 10 days' intervals than in those receiving it on 7 consecutive days.

From an extensive trial FASTOVSKAIA and CHENDEROWITCH (p. 683) conclude that the Russian synthetic remedies acriquine and plasmocide are in every way as effective as quinine and that in the doses used (acriquine 0·15 gm. twice daily for 7 days; plasmocide 0·03 gm. twice

daily for 5 days) they can be recommended for mass treatment. BARBOSA (p. 12) advises short treatments of 7 or 8 days only for *P. vivax* primary infections and reinfections, and uses atebrin associated with plasmoquine. Atebrin for 5 days followed by plasmoquine for 4 days gives excellent results in *P. falciparum* infections.

In the prevention of relapses and of the development of "healthy carriers" in Holland the Malaria Commission (p. 401) recommend the 3-week plasmoquine cure advocated by SINTON [see this *Bulletin*, 1930, Vol. 27, p. 656; 1931, Vol. 28, p. 596; 1936, Vol. 33, p. 688].

STAUSS (p. 683) discusses the by-effects of plasmoquine and atebrin. The former should be given in daily doses of 0·01 gm. per ten kilo. body weight. Plasmoquine plus atebrin is not so well borne as either alone, but if in the ratio 1 : 20, as in atepe tablets, there are fewer complaints. It is better to start plasmoquine treatment some days after the atebrin course is ended. In plasmoquine treatment there may be slight harmless albuminuria, and intracellular methaemoglobin is responsible for cyanosis. Liver damage and all circulatory symptoms recorded may be due to the drug but can be seen equally in untreated malaria. Albuminuria, haemolysis and methaemoglobin formation are not caused by atebrin; the yellow colour developed is in no way connected with jaundice. CHOREMIS and SPILIOPOULOS (p. 398) report cases of laryngeal and other paralyses and of peripheral neuritis following the administration of atebrin or plasmoquine. They conclude that these drugs are neurotropic and advise that courses should not exceed 5 days, and that those suffering from malarial cachexia should receive smaller doses than those customarily prescribed, together with one of the vitamin B preparations. Haemoglobinuria in a patient who had, during the three days before its onset, been taking full doses of atebrin without other drugs, is described by LUCHERINI (p. 397). After recovery the patient was treated with atebrin without ill effects.

DOZORTSEVA (p. 259) reports on the pharmacology of plasmocide and acriquine compound.

Tests.—PRUDHOMME (p. 784) describes a new method for the detection and estimation of quinine in urine.

LATASTE *et al.* (p. 815) describe a method for estimating quinacrine in the blood. The drug has a definite affinity for the red cells, but only 4 per cent. of the total amount ingested could be found in the blood. FARINAUD *et al.* (p. 816) show that the maximum concentration of quinacrine in the blood for any given individual remains constant whatever the number and frequency of treatments; repeated administration results in excessive urinary excretion but no increase in the blood maximum.

TCHITCHIBABINE and HOFFMANN (p. 580) describe a test, in which HIO_3 is used, for the detection of plasmoquine, rhodoquine and plasmocide in urine. NANDI and DIKSHIT (p. 1008) describe a test for plasmoquine in tissues, but which cannot be used with urine.

Sulphonamides.—Various sulphonamide preparations were tested in benign and subtertian infections by DURAND (p. 814) but he concludes that they cannot replace the usual drugs. NIVEN (p. 399) has tested sulphanilamide in all three types of malaria and concludes that in comparison with quinine (with which controls were treated) it is much less efficient, more dangerous and much more costly. FAGET *et al.* (p. 260) report unfavourably on prontosil and sulphanilamide as a result of the treatment of one *P. falciparum* and two *P. vivax* cases, and MENK and MOHR (p. 786) report unfavourably on prontosil.

SORLEY and CURRIE (p. 400) however found sulphanilamide to cause rapid alleviation of symptoms in *P. vivax* infection, but in view of the persistence of parasites and of relapses they recommend that this treatment be followed by a course of atebrin. FARINAUD and RAGIOT (p. 786) found that soluseptasine, though useful against schizonts, had no action on gametocytes of *P. falciparum* and *P. malariae*, though gametocytes of *P. vivax* were eliminated. PAKENHAM-WALSH and RENNIE (p. 12), report that sulphonamide preparations eliminated parasites from the blood and caused cessation of rigors in a patient with *P. vivax* infection, but there was a later relapse.

SINTON *et al.* (p. 925) record experiments which show that proseptasine appears to have a true causal prophylactic action against the strain of *P. falciparum* used, in the sporozoite stage.

Other drugs.—VOORHOEVE (p. 260) obtained success in the treatment of malarial splenomegaly by intramuscular injections twice daily of 2 cc. iodinequinine (a mixture of quinine, adrenalin, iodine and glycerol).

KIKUTH (p. 816) states the properties of certuna (cilional); it is well tolerated, it can prevent exflagellation, it acts against gametocytes of *P. falciparum* and *P. vivax* and in minimal doses it arrests the development of the fertilized female at the oöcyst stage. It has no prophylactic action in induced human malaria. Although cilional (certuna) in doses of 0·03 gm. three times daily to a total of 0·35 to 0·4 gm. is usually sufficient to eradicate gametocytes of *P. falciparum*, CHOPRA *et al.* (p. 499) prefer plasmoquine which, in doses of 0·02 gm. daily for 3 days is not toxic and is effective. SINTON *et al.* (p. 401) found that certuna, which is effective against the gametocytes of *P. falciparum*, failed to prevent infection by sporozoites when given to patients in varying doses and at various intervals before the sporozoite injections. CHOPRA and BASU (p. 786) failed to prevent infection of mosquitoes by treating three *P. falciparum* gametocyte carriers with cilional.

DE NUNNO (p. 500) considers antimony tartrate to be a causal prophylactic in that patients lose the power of infecting anophelines. Series of patients treated with quinine and with antimony tartrate were compared; the development of gametocytes was much less in the latter, and in those treated after gametocytes were present, the gametocytes in the latter group lost their normal appearance and disappeared rapidly from the blood. Antimony tartrate is given intravenously in a 1 per cent. solution on alternate days to a total of 120 to 200 cc.

GOLDMAN (p. 398) as a result of trial in 24 induced and one natural infection with *P. vivax* considers mapharsen (an arsenated benzine compound used in syphilis) to be the drug of choice. Parasites disappear almost at once and further febrile attacks are prevented unless due within 24 hours of the injection of the drug. It is as effective as atebrin and is safe; recurrences are rare. The dose is 0·04 to 0·06 gm. intravenously, according to the patient's weight, and the patient should be fasting.

VAN RIEL (p. 787), failed to obtain useful results with cuprochin in *P. falciparum* infections.

DEVINE (p. 13) has studied the changes in blood and urine caused by undecane diamidine. These cannot be further abstracted.

The Ascoli treatment.—PIZILLO (p. 685) considers that the Ascoli method of treatment represents an exact reproduction of the spontaneous recovery from the disease. He (p. 12) treated 16 cases of

recently acquired primary infections by this method. Very small doses of quinine in addition to the adrenalin are sufficient to control the fever and splenic enlargement does not occur. He (p. 813) reports a patient suffering from a relapse of *P. falciparum* malaria who was treated with adrenalin. Quinine was given during the febrile periods but suspended when the temperature fell. Grave symptoms appeared during a recurrence of fever but improved under quinine and adrenalin and complete recovery ensued. The author points out the apparent efficiency of adrenalin in the treatment of pernicious symptoms [but it is at least possible that *continuous* quinine treatment may have prevented the onset of the pernicious symptoms. It is noticeable in the information given that these dangerous symptoms disappeared when quinine was used. During the first four days of fever the patient was given no treatment ; the wisdom of such a procedure in subtertian malaria may be questioned]. He (p. 400) discusses the late febrile manifestations which are occasionally experienced after the termination of the Ascoli method of treatment. These differ from true relapses in that recovery is spontaneous.

Drug Prophylaxis.

Should the present war extend to countries in which malaria is endemic, the subject of drug prophylaxis will be important to the combatant armies. The work here summarized deals with indigenous populations, immune or partially immune, and with groups of labourers, probably immigrants and probably at least partially immune. Although there has been no recorded work during the year on the protection by drugs of non-immune immigrants to endemic areas, it is possible that measures required for European troops in malarious countries would be on the lines here advocated for the labour groups, and, partly for that reason, this division has been made.

Indigenous populations.—The Anti-Malarial Service of the Institut d'Hygiène of Morocco (p. 686) relates drug prophylaxis to the state of premunition existing. In a premunized population in a hyperendemic area, it is enough to treat children and those suffering from attacks. In a population insufficiently premunized, the drug used should be given to the whole population, the rhythm being determined by the intensity of anophelism and the rate of gamete carriers. In Morocco weekly administration is enough, but fortnightly is insufficient where anophelism is high [compare WILSON above]. DECOURT (p. 818) discusses prophylaxis with quinacrine, rhodopraequine or an association of the two, premaline. A fixed daily dose of quinacrine should be used and the rhythm varied with the circumstances. The association of a gametocide is advantageous and if antiplasmodial measures are adopted the drugs should be given twice each month.

In Abyssinia CORRADETTI (p. 677) recommends prophylactic quinine 0·6 gm. on three consecutive days each week during the malaria season. DE MELLO (p. 9) administered plasmoquine 0·02 gm. and quinine sulphate 0·5 gm. daily for 8 days, followed by the same doses once a week for 12 weeks, to a community in Portuguese India in which the spleen rate was over 50 per cent. A considerable decrease in fever resulted.

CLARK and KOMP (p. 819) consider that the treatment of sub-clinical cases may destroy a certain amount of immunity in hyperendemic

areas. Drug prophylaxis failed to control the cyclical epidemic of malaria in Panama in 1935, but the administration of quinine sulphate 15 grains daily, or atebrin 0·1 gm. thrice daily for 5 days, followed by plasmoquine 0·01 gm. twice daily for 5 days to all carriers discovered in the monthly surveys has almost abolished clinical illness without eradicating the disease. WINCHESTER (p. 687) in a *P. falciparum* area in Georgia, U.S.A., found that 0·05 gm. atebrin daily from May to October greatly reduced the parasite and spleen indexes of a negro population in comparison with a control group. In a district of Georgia, U.S.A., where mosquito control was impossible, HILL and GOODWIN (p. 261) found that atebrin, 1½ grains three times weekly, reduced by over 17 times the proportion of clinical attacks in a group so treated in comparison with a control group. The experiment lasted 2 years. BISPHAM (p. 500) uses 4½ grains of atebrin weekly for 4 weeks or longer as a prophylactic in the southern U.S.A. and believes that even in a highly infected area this will maintain maximum effectiveness and minimum infection. Over 90 per cent. of *P. vivax* carriers can be cleared of all parasites.

MELIK-ADAMIAN (p. 262) in Russia considers that prophylactic treatment with acriquine should be reserved for those who have suffered from malaria the previous year. Identification and treatment of parasite carriers are important measures. KOSTIĆ and ANTIĆ (p. 924) report good results from the prophylactic use of atebrin in a group of prisoners and warders in an endemic area in Jugoslavia.

Selected groups, probably immigrant peoples.—The Malaria Advisory Board of the F.M.S. (p. 128) find that 0·3 gm. atebrin weekly suffices for the effective control of clinical malaria [presumably in estate workers]. TEICHLER (p. 785) treated prophylactically 500 natives of Tanganyika Territory in a highly malarial district, with 0·1 gm. atebrin thrice daily for 3 days and considers that by giving such short courses a labour force may be kept healthy, although malaria is not eradicated.

In a hyperendemic area of Cochin-China CANET (p. 818) advises, for plantation labourers, the adoption of antilarval and other measures combined with drug prophylaxis varied to suit conditions. He gives 0·3 gm. quinacrine as a daily dose, normally once a week, but on the advent of heavily infected labourers, or during cold spells or arduous labour, may give this dose every 5 or 3 days. The association of a gametocide has not, in his experience, served any useful purpose.

In contrast to his experience in treating fresh sporadic cases of malaria with atebrin injections [see above, *Treatment*] SIMEONS (p. 686) records the great diminution in malaria incidence among mill workers in the Deccan following his introduction of the method of treating every new case with two atebrin injections without quinine or plasmoquine. Oiling of river beds in the dry season was carried out. This was previously an area of severe endemic malaria, and probably a high degree of immunity is present.

In a military post in French Indo-China in which prophylactic quinine had been insufficient, CHARBONNIER (p. 501) found a marked improvement after the addition of quinacrine 0·2 gm. and praequine 0·02 gm. once weekly. Neighbouring posts not so treated continued to experience severe malaria.

FATTOVICH and LENTI (p. 262) used manganese iodo-mercurate and spleen extract together. They consider that a real prophylactic action is obtained, possibly through the reticulo-endothelial system.

Other Methods of Control.

BOYD (p. 808) remarks that malaria control should be, not a campaign, but a long term programme, and that malaria should be built out. HACKETT *et al.* (p. 820) give an account of naturalistic methods in the control of malaria.

In hyperendemic areas in East Africa WILSON (p. 126) points out that the only available method of control is anopheline control, which is far too expensive unless there are strong reasons for its adoption, for instance the aggregation of a large number of non-immunes. It is necessary in townships, temporary undertakings such as railway construction, on estates and along railways where, for example, stopping places occur in dangerous districts.

Oiling.—WATS and BHARUCHA (p. 10) show that cashew nut oil is very toxic to larvae, rapid in action and cheap. In spite of the variations in toxicity in the oil from different sources and of the fact that it is a skin irritant even when diluted with kerosene, its use is worth consideration. AFANASSIEV (p. 788) finds the distillate of coke filters to be an efficient larvicide oil.

MICHELSON (p. 403) describes an arrangement of wicks leading from tins of oil to gunny screens for the continuous oiling of streams. BLACKLOCK (p. 336) has devised a method for oiling the water in flushing cisterns.

Other larvicidal methods.—SHIPIZINA (p. 581) shows that the mixture of toxic powder larvicides with large volumes of talc is irrational from the point of view of the alimentary physiology of larvae and is unnecessarily costly. The resistance of larvae to the action of arsenical poisons increases with age. BRINK and DAS CHOWDHURY (p. 1009) show that *A. stephensi* and *C. fatigans* cannot breed in water containing 0·75 per cent. ammonium sulphate.

WASSILIEFF (p. 332) writes of the value of Gambusia.

MANSON (p. 1009) describes the larvicidal action of certain Assamese plants. AMBIALET (p. 335) found Williamson's herbage cover method to be unsuitable to conditions in Constantine, Algeria.

STRICKLAND (p. 137) shows that in the coastal lagoons of Orissa *A. ludlowi* will breed if communication with the sea is maintained but will not if the lagoons are bunded up and receive only fresh water.

STROTHER-SMITH (p. 403) states that in a cantonment in India the institution of a weekly " dry day," during which all water receptacles must be empty for 3 hours, has resulted in a marked diminution in mosquito prevalence.

MACDONALD (p. 926) has designed a siphon for the automatic flushing of streams.

HINMAN (p. 334) shows that fluctuation of the water level in reservoirs in Alabama kills much of the vegetation round the edge, which becomes almost clean and therefore renders extensive breeding of *A. quadrimaculatus* impossible.

PEASTON and RENNER (p. 926) report the improvement in general infection rates attributed to permanent canalization of a stream and permanent street drainage in part of Freetown, Sierra Leone.

Spraying of insecticides.—The spraying during late summer and autumn of houses regarded as centres of infection in Holland is reported by the Malaria Commission (p. 401). Shelltox was used and it was found that spraying was necessary every 14 days, during which time the houses remained, with the generous amounts used, unattractive to

mosquitoes. Results in one village were satisfactory in that the incidence of malaria the following year was greatly reduced. *A. maculipennis atroparvus* is in this way prevented from infecting man in autumn and it is known that many persons infected then only show symptoms the following spring. MOREAU (p. 332) finds that spraying with a watery suspension of pyrethrins is a valuable addition to classical methods of prophylaxis. In a native house a daily spraying at 5 p.m. enabled one after the second day to pass the night without being bitten. The details are given in the original abstract. Spraying with 3 per cent. lethane in kerosene with a Phantomyst spray was successfully used by STROTHER-SMITH (p. 403) for the destruction of adult mosquitoes.

POTTER and HOCKING (p. 921) describe an apparatus in which flying insects can be subjected to a finely divided cloud of insecticide and from which samples of the atmosphere can be taken for study.

Screening.—DAVEY and GORDON (p. 582), after careful experiment recommend that the maximum size of aperture for screening against mosquitoes in W. Africa must not exceed 0·047 inch (1·2 mm.); this aperture is provided in a screen of 16 meshes to the linear inch and composed of wire of 28 Standard Wire Gauge.

Malaria of Monkeys and Birds.

Aetiology.—HEWITT (p. 336) has noted growth of young intra-corpuscular forms of *P. cathemerium* in infected blood added to a culture medium of egg slope, saline, dextrose and serum. GAVRILOV *et al.* (p. 929) show that *P. gallinaceum* will remain alive and virulent for 21 days in defibrinated blood at 0° to 5°C., and for 10 days in cultures of bone marrow.

BASU (p. 587) describes a new parasite of herons which he proposes to name *P. heroni*; development to the oöcyst stage was observed in *C. fatigans*.

HEWITT (p. 1009) describes a staining technique for demonstrating avian malaria parasites in tissue sections.

HEGNER and ESKRIDGE (p. 338) found that 90 per cent. of the merozoites of *P. relictum*, *P. circumflexum* and *P. elongatum* enter the young red cells of birds. HEWITT (pp. 585, 929, 1010) shows that *P. cathemerium* has a special affinity for young red cells. When these are few in number multiple infections are common and *vice versa*.

HENRY (p. 929) demonstrated a latent period of 4 or 5 days after mosquito infection, before the blood of fowls becomes infective.

DECOURT and SCHNEIDER (p. 586) describe granules seen in lymphoid cells of the lymphoid masses and the blood of fowls apparently recovered from *P. gallinaceum* infection. The masses of lymphoid tissue in these fowls were found to be infective to others although the spleen was not, and although no recognizable parasites could be found. They think that these granules may represent a stage of development of the parasites.

Exo-erythrocytic Schizonts.—Discussing the unpigmented exo-erythrocytic forms of bird malaria parasites, KIKUTH and MUDROW (p. 337) conclude that they play a definite rôle in the malaria cycle, and that they do not belong to the toxoplasma group. KIKUTH (p. 816) states that these forms are not susceptible to known drugs though plasmoquine may be exceptional. Similar forms have been found in

bone marrow in man. GIOVANNOLA (p. 930) also considers exo-erythrocytic schizonts in *P. gallinaceum* infections as stages in the development of the parasite.

JAMES and TATE (p. 339) describe exo-erythrocytic schizogony in *P. gallinaceum* infection of fowls, noting that these schizonts appear after both sporozoite infections and blood inoculations. They are not found until intra-erythrocytic forms appear, and they are present first in the brain, where they may give rise to generalized paralysis. RAFFAELE (p. 931) postulates two types of merozoites arising from exo-erythrocytic schizonts, the histotropic for continuation of exo-erythrocytic schizogony and the haemotropic for initiation of erythrocytic development. The fact that atebrin fails to destroy the non-pigmented forms in birds may explain its inability to act as a prophylactic in man. CHORTIS (p. 930), however, thinks that they are merely young parasites engulfed by the reticulo-endothelial cells, and play no real part in development. MANWELL and GOLDSTEIN (p. 1011) agree with this view. HEGNER and WOLFSON (p. 584), conclude that it is not yet proved that they belong to the Plasmodium concerned (*P. cathemerium* in their experiments). DECOURT and SCHNEIDER (p. 586) regard them as accidental by-products following infection both by sporozoites and blood inoculation.

RODHAIN (p. 931) found exo-erythrocytic schizonts in *P. relictum* infections of penguins, both after sporozoite infection and inoculation of infected blood.

Transmission.—ROUBAUD *et al.* (p. 928) show that *P. gallinaceum* will develop completely in *Aëdes geniculatus*. HERMAN (p. 337) has investigated the mosquito transmission of *P. circumflexum* and *P. cathemerium.*

BRUMPT (p. 404) discusses the origin of Ross's "Black spores" and regards them as chitinized oöcysts or chitinized groups of sporozoites. Other extraneous bodies may become chitinized but the author has never found black spores in mosquitoes fed on uninfected fowls or on birds infected with parasites which do not develop in the mosquitoes used.

Pathology and Serology.—AFRIDI (p. 823) studied the spleen of monkeys after it has been brought to an accessible situation by operation. In *P. cynomolgi* infection the chief enlargement occurred after the peak of parasite infestation, but in *P. knowlesi* before the peak. In *P. knowlesi* infection the peripheral blood lags 2–4 hours behind the splenic blood in the number and stages of the development of the parasites.

TUPA and CIUCA (p. 822) show that in monkeys malarial infection is associated with hypertrophy of the R.E.S. in those organs in which the infected red cells come into close contact with histiocytes, and maintain that lymphocytes do not become transformed into macrophages. Lymphatic glands do not contribute to the defensive process. This view does not agree with that of GARNHAM (p. 492) who considers that lymphocytes reaching the placenta in pregnant women multiply and become converted into phagocytic macrophages under the malarial stimulus. YOUNG (p. 338) shows that in canaries the severe *P. cathemerium* infection causes a rapid activation of lymphoid tissue and mononuclear cells in the spleen, and of bone marrow and liver, whereas with the milder *P. rouxi* infection the activation in the spleen is limited to the mononuclear cells of the red pulp. Resistance to superinfection appears to be correlated with the degree of macrophage phagocytosis

during the acute stage; extensive phagocytosis results in well developed immunity.

BLOOM and TALIAFERRO (p. 586) describe the process of regeneration of the infarcts commonly seen in the spleen of canaries infected with *P. cathemerium.*

EATON (p. 405) shows that agglutinins against infected red cells or liberated (mature) parasites are found in monkeys infected with *P. knowlesi.* The reaction is specific and the titre rises as the infection subsides or if superinfection is induced. He (p. 821) describes a soluble antigen present in the serum of monkeys suffering from acute *P. knowlesi* infection, which gives a strong complement fixation reaction with serum from hyper-immunized animals. Monkeys immunized with this antigen are in no way immune to infection. COGGESHALL and EATON (p. 404) have prepared, from the blood or spleens of monkeys infected with malaria, antigens which give positive complement fixation reactions with serum of infected animals. Some animals which produced large amounts of protective antibodies were bad producers of complement-fixing antibodies, and the two are therefore probably distinct. They (p. 405) show that the severity of *P. knowlesi* infection in *M. rhesus* does not depend on the size of the infecting dose. Serum from chronically infected monkeys will protect against death if administered at the time of the injection of parasites and daily afterwards, and if incubated for half an hour with the parasites, may kill them.

MOSNA (p. 927) shows that the serum of monkeys suffering from chronic *P. knowlesi* infection contains small amounts of immune bodies of a protective nature. Although the antibody content of the blood of monkeys in the chronic stage of *P. knowlesi* infection is low, COGGESHALL and KUMM (p. 406) show that it may be greatly raised by superinfection to an optimum of 7 times during two months. CIUCA *et al.* (p. 823) show that after recovery from *P. knowlesi* infection of man there is a definite immunity independent of premunition.

Experiments carried out by HEGNER and ESKRIDGE (p. 585) indicate that serum from birds in the acute stage of *P. cathemerium* infection contains some substance which, though unable to suppress the infection in fresh birds, is capable of warding off the ill effects of that infection.

Clinical.—HUFF (p. 1010) shows that segmentation of bird malaria parasites produces no rise of body temperature.

BOYD (p. 1011) found that the rapid fall in the numbers of *P. cathemerium* at the crisis of the initial attack is due to the combined effect of lowered multiplication rate and increased destruction.

MILAM and COGGESHALL (p. 583) record observations on the duration of *P. knowlesi* infections in man and note that human blood may be positive to monkeys although parasites may never have been detected in smears. Similar invisible infections may occur in human malaria, undetected for want of a suitable host.

SINTON *et al.* (p. 583) record failure to infect man with *P. cynomolgi.*

Treatment.—KRITCHEVSKI (p. 13) points out the importance of the integrity of function of the reticulo-endothelial system for the intrinsic action of antimalarial drugs. Trypan or pyrrole blue administered to canaries infected with *P. praecox* renders otherwise inactive doses of plasmocide active, renders active an otherwise inactive quinoline compound, but has no effect with quinine or atebrin. Trypan and pyrrole blue are both deposited in the R.E.S., where it is thought that they react with plasmocide to give a new compound.

CHRISTOPHERS and FULTON (p. 340) give an account of the course of *P. knowlesi* infection in monkeys. Atebrin is effective in treatment but relapses invariably occur ; 1 : 11 normal undecane diamidine is active but less certain than atebrin.

DAS GUPTA and CHOPRA (p. 583) found that although prontosil soluble will cure *P. knowlesi* infections in monkeys, it is not so satisfactory as atebrin and the doses required are out of all proportion to the human doses. RODHAIN (p. 1011) finds astreptine to be active against *P. reichenowi* infections of chimpanzees, though not so effective as atebrin.

MANWELL and HARING (p. 588) show that *P. vaughani* infections are highly susceptible to atebrin and plasmoquine.

CHOPRA and DAS GUPTA (p. 1012) find M. & B. 693 better than atebrin in *P. knowlesi* infections in that it is capable of preventing relapses. COGGESHALL (p. 824) reports that sulphanilamide is capable of eradicating completely *P. knowlesi* infection of *M. rhesus*, but that there is evidence of residual immunity for about 3 months after treatment. *C. Wilcocks.*

THE TYPHUS GROUP OF FEVERS.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

General.—GIROUD (p. 252) shows that in the nodules produced by intradermal injections of typhus virus in animals there is only a small amount of virus and if these nodules are excised and emulsified and reinoculated intradermally in series the virus content falls progressively.

SALEUN (p. 253) describes a fatal disease of dogs in Brazzaville which is connected with Rickettsia-like bodies.

BURNET *et al.* (p. 253) found no relationship between the Rickettsia of Q fever and other rickettsial diseases, but quote DYER who found some relationship with the virus obtained from wood ticks in Montana. PARKER *et al.* (p. 254) have recovered a mildly pathogenic Rickettsia-like agent from *Amblyomma maculatum* in Texas. The infection gives complete cross immunity reactions with Rocky Mountain and boutton-neuse fevers, but is apparently not identical with either. COX (p. 254) failed to cultivate in cell-free medium the infectious Rickettsia-like agent previously isolated from ticks in America. Since this agent is a filter passer the name *Rickettsia diaporica* is suggested.

MACCHIAVELLO (p. 254) gives the details of the normal blood constituents of white rats, which he uses in experimental work on typhus.

Louse- and Flea-borne.—IONESCO-MIHAESTI *et al.* (p. 255) report that in Bessarabia there were 9,000 cases in 1936 and 1937 but the numbers diminished greatly thereafter. Numerous personnel were employed in the campaign of detection and isolation of cases and in mass delousing. MARIANI (p. 255) states that typhus in Abyssinia is largely louse-borne.

MACCHIAVELLO (p. 255) found that in dried and frozen infected tissues the virus survived from 53 to 79 days. He (p. 255) gives his

reasons for believing that *R. prowazeki*, and not a filterable virus, is the cause of typhus. He (p. 256) details a method for staining Rickettsia.

RAYNAL *et al.* (p. 256) as a result of researches in Shanghai, state that the common murine-type may, under exceptional conditions of overcrowding (as with refugees), be transmitted from man to man by lice, during the course of which stage the virus becomes modified to an intermediate between the murine and classical types. CLEAVE (p. 257) reports two cases from Hong Kong.

JOANNON INFANTE (p. 258) describes a rapid microtest method for performing the Weil-Felix reaction and records close agreement between the results obtained in this way and those, in the same patients, obtained by the standard technique.

MASUCCI (p. 257) gives general directions as to treatment and GIUNTA and D'IGNAZIO (p. 257) recapitulate their method of combining drug treatment with vitamins B and C. LE RENARD and RAYNAUD (p. 258) report recovery after decapsulation of one kidney in a patient with suppression of urine in typhus. Toxic nephritis is a common cause of the nervous symptoms and coma experienced.

REITLER *et al.* (p. 259) describe two types of endemic typhus in Palestine, one moderately severe with high titre *Proteus X19* reaction, the other very severe with low titre *Proteus X19* reaction. These usually affect non-immunized immigrants. CASTANEDA and SILVA (p. 259) isolated murine, intermediate or epidemic virus from patients admitted to the General Hospital of Mexico City.

RUGE (p. 259) reports a case of murine typhus in a sailor at Hamburg and thinks that infected rats may have boarded his ship at a Spanish Mediterranean port.

ROBERTS (p. 260) shows that in Kenya, besides the tick-borne type of typhus there exists also the flea-borne murine type. MAISTER *et al.* (p. 260) report a case of flea-borne typhus contracted in a grain store in Natal, S. Africa; rats and fleas caught in the store were found to be infected. LIU and CHUNG (p. 261) report murine typhus in Peiping, and WOLFF (p. 261) recovered a murine strain from rat fleas in Ceylon.

PANG (p. 261) shows that the murine virus produces a local lesion on the chorio-allantoic membrane of fowl embryo as well as a generalized infection which often kills the embryo. CASTANEDA (p. 261) describes haemorrhagic lesions in the lungs, and the presence of Rickettsia in the cells lining the bronchi of animals infected by the nasal route.

WOLFF and DE GRAAF (p. 262) show that animals can only be infected with the blood of patients with shop typhus (*Proteus OX19* type) if the blood is taken during the period of fever. A scrotal reaction is given which differs from that seen in infection with *Sp. minus* and *Pf. whitmori*.

BLANC *et al.* (p. 262) show that the donkey louse can be infected from an animal infected with the murine virus.

Tick-borne.—SALEUN (p. 263) reports boutonneuse fever diagnosed at Brazzaville.

MACVICAR (p. 263) reports tick-bite fever with local lesion, in 4 natives in S. Africa. GEAR and DE MEILLON (p. 263) have established in guineapigs a strain of virus from *Haemaphysalis leachi*, which is immunologically similar to strains of tick-bite virus isolated from man but does not protect against endemic or epidemic typhus. *H. leachi* is capable of transmitting the infection while biting and feeding.

TOPPING (p. 264) found no benefit in the treatment of experimental Rocky Mountain fever and endemic typhus with prontosil or sulphapyridine.

Mite-borne.—WOLFF and DE GRAAF (p. 264) describe two cases of mite-borne typhus in Java where it is rare. The strain is identical with Sumatran and other strains and field rats are able to act as the reservoir of the disease. ROTON (p. 265) describes a case of fever with severe complications in Annam. Although the Weil-Felix reaction was negative he regards it as a case of tsutsugamushi fever. MORISHITA (p. 266) records 166 cases in Formosa during the period 1933–38. JOLLY and DI RUGGIERO (p. 266) observed in Guadeloupe a case of typhus in which *Proteus OXK* was agglutinated.

LE COSQUINO DE BUSSY and VAN LOGHEM (p. 266) found that strains of Proteus isolated in Holland were agglutinated in high titre by some scrub typhus sera from Sumatra. They conclude that an *X* component is inherent in every strain of Proteus.

Vaccination.—LAIGRET and DURAND (p. 266, 267) have been able to stabilize the virus of typhus for vaccination purposes by intraperitoneal injection into mice of mouse brain infected by previous intraperitoneal injection. The infected brains are used in preparing the vaccine, and 7,000 persons have now been successfully vaccinated. SPARROW (p. 267) obtained heavy growths of murine Rickettsia by infecting lice by the anal route. With MARESCHAL (p. 268) she showed that the intestine of these lice may be used to infect man ; by the conjunctival route a mild fever is produced, but by subcutaneous injection typical typhus may result, but depends on the size of the infecting dose. PINKERTON and BESSEY (p. 268) show that rats maintained on a diet deficient in riboflavin and infected with typhus die with a profuse peritoneal exudate rich in Rickettsia. This method may be useful in preparing vaccines. COX (p. 268) shows that a vaccine prepared from infected fowl embryo and killed by carbolic and formalin protected guineapigs against Rocky Mountain virus.

BLANC and BALTAZARD (p. 269) show that immunity after vaccination with the murine virus or an attack of murine typhus may protect against that type and against epidemic typhus for at least 5 years, and therefore advocate regular vaccination in endemic areas.

KAWAMURA *et al.* (p. 269) considers that the Pescadores strain of tsutsugamushi virus may be used as a preventive vaccine in the endemic regions. KAWAMURA and UEDA (p. 269) describe their method of using this strain in the fever therapy of G.P.I. ; it is safe and apparently successful and can easily be handled. *C. W.*

GIROUD (Paul). Dosage de la virulence des nodules cutanés provoqués par l'inoculation ou la réinoculation de Rickettsies. Pouvoir neutralisant de la peau. [**Measurement of the Virulence of the Cutaneous Nodules produced by the Inoculation or Reinoculation of Rickettsia. Neutralizing Power of the Skin.**]—*C. R. Soc. Biol.* 1939. Vol. 131. No. 22. pp. 1154–1156.

When an emulsion of typhus virus (brain of guineapig) is inoculated into the skin of rabbit or guineapig a nodule is produced. If this nodule is excised and emulsified and injected intraperitoneally into a guineapig infection results with fever and orchitis but it does not produce any reaction if injected intradermally.

A nodule due to a third inoculation produces infection and a slight reaction in the skin. A sixth inoculation nodule does not produce any fever and gives no reaction in the skin.

The impression gained is that there is only a small amount of virus in the skin nodules and this becomes less and less after reinoculation.

The skin of immunized animals shows neutralizing power when mixed with virus and injected. *D. Harvey.*

BRAZZAVILLE : AFRIQUE EQUATORIALE FRANÇAISE. RAPPORT SUR LE FONCTIONNEMENT DE L'INSTITUT PASTEUR DE BRAZZAVILLE PENDANT L'ANNÉE 1938 [SALEUN (G.)]. pp. 92–94.—Rickettsioses. [**Rickettsioses.**]

This paper deals solely with a fatal disease among dogs in Brazzaville ; this disease was characterized by fever, nodules on the skin, enlarged lymphatic glands, convulsions and paralysis. Careful cultivations were made both during life and post-mortem but without result. Smears from the organs of infected animals showed Rickettsia-like bodies, these also were seen in the tissues of guineapigs inoculated from sick animals. There was evidence that the virus was filterable, dogs and guineapigs were infected with filtrates from the tissues of the sick animals. *D. H.*

BURNET (F. M.), FREEMAN (Mavis), DERRICK (E. H.) & SMITH (D. J. W.). **The Search for Immunological Relationship between " Q " Fever and Other Rickettsioses.**—*Med. Jl. Australia.* 1939. July 8. 26th Year. Vol. 2. No. 2. pp. 51–54. With 1 fig. [10 refs.]

Emulsions of the Rickettsia of " Q " fever were tested for agglutination against a number of sera from human beings and from animals infected with a variety of Rickettsial diseases. Specimens of human sera of the following diseases were employed, endemic typhus from Queensland and from South Africa, scrub typhus from Queensland and tick bite fever, louse typhus and murine typhus of South Africa, also Rocky Mountain fever, all these tests were completely negative, even in a dilution of 1/10. Specimens of serum of sheep infected with heartwater (S. Africa) and with a tick-borne fever in Scotland also gave negative results. The morphology of the Rickettsia of " Q " fever was also found to differ from that of the organism found in the tick-borne fever of sheep. Rabbits were inoculated with repeated doses of emulsion of the " Q " fever Rickettsia and a high titre of agglutination was produced but these sera did not agglutinate any strain of Proteus such as *OX19*, *OX2* or *OXK*. It was also found that guineapigs which had been fully protected with doses of Rocky Mountain fever vaccine were not protected against inoculation of the virus of " Q " fever, a similar series of tests was carried out by Dr. DYER in America with a like result. Dr. Dyer found in addition that guineapigs protected against virus of " Q " fever are also protected against the filter passing infectious agent isolated from Rocky Mountain wood ticks, and also the sera of patients recovered from " Q " fever gave definite protection against the Montana virus ; thus indicating some relationship between " Q " fever and the infection obtained from wood ticks in Montana. [See this *Bulletin*, 1939, Vol. 36, p. 986.]

D. H.

PARKER (R. R.), KOHLS (Glen M.), COX (George W.) & DAVIS (Gordon E.). **Observations on an Infectious Agent from** *Amblyomma maculatum.*—*Public Health Rep.* 1939. Aug. 11. Vol. 54. No. 32. pp. 1482–1484.

A Rickettsia-like infectious agent mildly pathogenic for guineapigs has been recovered from ticks—*Amblyomma maculatum*—collected near Cleveland, Texas. As observed in male guineapigs there is usually a characteristic temperature curve with oedema and reddening of the scrotum, but the infection may be inapparent. There is complete cross immunity in guineapigs between this infection and both Rocky Mountain spotted fever and boutonneuse fever but with endemic typhus the degree of cross immunity is less consistent; however it agrees with none of these diseases in all particulars. *D. H.*

COX (Herald R.). **Studies of a Filter-Passing Infectious Agent isolated from Ticks. V. Further Attempts to cultivate in Cell-Free Media. Suggested Classification.**—*Public Health Rep.* 1939. Oct. 6. Vol. 54. No. 40. pp. 1822–1827.

Two types of media were employed in these further attempts to grow this filterable virus in cell-free media :—

A. Noguchi Leptospira medium prepared with rabbit serum.

B. The same medium containing in addition 0·2 per cent. of each of the following sugars : glucose, lactose, sucrose, maltose and inulin.

The results of these experiments confirm the work previously reported indicating that the Rickettsia-like agent being studied cannot be cultivated and carried in serial passage in cell-free media commonly employed for cultivation of Bartonella ; but in culture tubes kept at 28°C. the virus survived for at least 100 days with no appreciable loss of infection titre.

Since the outstanding characteristic differentiating this agent from the known pathogenic Rickettsia is its property of filterability the name *Rickettsia diaporica* (a passer through) is suggested for it. [See also this *Bulletin*, 1939, Vol. 36, p. 986.] *D. H.*

MACCHIAVELLO (Atilio). Sistematica del grupo Rickettsiae. [**Systematic Description of the Rickettsia Group.**]—Reprinted from *Rev. Chilena de Hig. y Med. Preventiva.* 1938. Vol. 1. pp. 297–330. [248 refs.]

MACCHIAVELLO (Atilio). Estudios sobre hematología del tifo exantemático experimental. I. Hematología de ratas albinas normales. [**Blood Changes in Experimental Typhus.**]—*Rev. Chilena de Hig. y Med. Preventiva.* 1939. Jan.–Mar. Vol. 2. No. 1–3. pp. 53–63.

This is the first of a projected series of papers in experimental typhus. The animals used are white rats. In order to estimate the effects on the blood it is necessary to know what are to be regarded as standards of the constituent elements. From examination of nearly two hundred apparently healthy adult male rats the following are postulated as the normal : red corpuscles 9,800,000 per cmm., haemoglobin by Sahli's method : Heart blood 103 per cent., femoral 101 per cent., tail 95 per cent. ; platelets average 675,000 (limits 320,000 and 938,000) ; leucocytes average 17,650 per cmm. ; differential count : polymorphonuclear neutrophile 27·1, basophile 0·1, eosinophile 2·6, lymphocytes

67·1, large mononuclears 2·9 [stated in the article as 29·2 per cent., clearly a mistake]; coagulation time 3 minutes 12 seconds (average of 18 rats). *H. H. S.*

IONESCO-MIHAESTI (C.), CIUCA (M.), BALTEANU (I.) & COMBIESCO (D.). Rapport de la commission sur l'épidémiologie et la prophylaxie du typhus exanthématique. [**Report of the Commission on the Epidemiology and Prophylaxis of Typhus.**]—*Bull. Acad. Méd. Roumanie.* 1939. 4th Year. Vol. 8. No. 4. pp. 421–435.

In Bessarabia in 1936 there were 5,000 cases of typhus and in 1937, 4,000. The cases commenced to appear in January and the peak occurred in March and April. In 1938 there was a marked diminution in the number of cases; in 1937, 21 cases occurred in one week and in the same week in 1938 only 1 case was detected.

The campaign against the disease consisted in the detection and isolation of cases, and mass delousing of the general population. Numerous personnel were employed and a continuous effort was made both winter and summer.

Research.—The writers consider that the endotoxin of Proteus is the factor responsible for the Weil-Felix reaction as this antigen is closely related to the toxin of typhus. This endotoxin is highly toxic for man and animals (enterotropic) but it is not neutralized by the serum of typhus convalescents. *D. H.*

MARIANI (G.). Particularités épidémiologiques du typhus exanthématique sur le haut plateau Ethiopien. [**Epidemiology of Typhus in Ethiopia.**]—*Bull. Office Internat. d'Hyg. Publique.* 1939. July. Vol. 31. No. 7. pp. 1225–1232.

A review of typhus in Abyssinia. The majority of cases are of the epidemic historic type and are louse-borne but other forms or types of typhus are met with but have not yet been identified. *D. H.*

MACCHIAVELLO (Atilio). Estudios sobre tifo exantematico. I.—Sobrevida y virulencia de los virus de los tifos Mejicano y Europeo congelados y desecados. [**Typhus. I. Survival and Virulence of Mexican and European Types of Virus after Freezing and Drying.**]—*Rev. Chilena de Hig. y Med. Preventiva.* 1937. Jan.–Dec. Vol. 1. No. 1. pp. 63–68.

The material employed was tissues—tunica vaginalis, blood or brain—of guineapigs infected experimentally, ground in a mortar with physiological saline, then dried and frozen in accordance with Flosdorf and Mudd's method. For injection this was dissolved in saline and inoculated intraperitoneally. The European variety could remain alive for at least 53 days and the Mexican for 79 days; either could therefore be despatched for vaccination purposes. *H. H. S.*

MACCHIAVELLO (Atilio). Estudios sobre tifus exantematico. II.—*Rickettsia prowazeki*, cuerpos de Mooser y virus tifico. [**Typhus. II. Rickettsia, Mooser Bodies and the Typhus Virus.**]—*Rev. Chilena de Hig. y Med. Preventiva.* 1937. Jan.–Dec. Vol. 1. No. 1. pp. 88–100. With 2 maps.

The author states that for years attempts have been made to prove that *R. prowazeki* is one of the forms of the virus of typhus, but not the

most virulent; others have maintained that the virus is ultramicroscopic, invisible by dark ground, and not thrown down by high-speed centrifugation.

He finds that 5,000 r.p.m. for three hours will not throw down all the Rickettsia of murine origin or of the European form from the tunica vaginalis of infected guineapigs. The intensity of disease set up by inoculation he found to be directly related to the quantity of Rickettsia present. He does not think that there is an invisible form, for when the centrifuging has been carried out for longer the Rickettsia disappear and the fluid does not cause the disease on injection. *H. H. S.*

MACCHIAVELLO (Atilio). Estudios sobre tifus exantematico. III.—Un nuevo método para teñir Rickettsia. [**Typhus. III. A New Method of staining Rickettsia.**]—*Rev. Chilena de Hig. y Med. Preventiva.* 1937. Jan.–Dec. Vol. 1. No. 1. pp. 101–106.

The author claims that the following method of staining Rickettsia is more easy to carry out, takes less time, only 3–5 minutes, and gives better results than those of Giemsa, Castaneda, Lepine, or Borrel.

A. Basic fuchsin. 0·025–0·1 gm.
Buffer solution at *p*H 7·4 or Aq. dest. 10 cc.

Mix and shake. Filter immediately before use; must not be used when the supernatant fluid begins to lose its typical colour.

The preparation is dried either by gentle heat, or better in the air, stained for 3–5 minutes—the shorter usually gives better results—letting the stain filter directly on to the slide. The buffer solution consists of a mixture of phosphates in distilled water and is kept at *p*H 7·4, diluted 1 in 3 for use.

B. Decolorize by 0·5 per cent. citric acid solution, 1–3 seconds.

C. Contrast stain, 1–2 seconds with the ordinary methylene blue (methylene blue 1 gm., alcohol 10, aq. dist. 100, phenol 5) diluted 1 in 10.

The Rickettsia, intra- or extra-cellular are stained a bright red on a pale blue background. Very fine preparations, but less permanent, are obtained by substituting Victoria blue 1–2 per cent. for the methylene blue, or thionin 2 per cent. or toluidin 1 per cent. Decoloration and contrast staining can be carried out at the same time by dissolving the counterstain in the citric acid solution. One drawback is that the fuchsin stain must be fresh and will probably have to be made up daily or even twice in a day. *H. H. S.*

RAYNAL (J.) & FOURNIER (J.). Le typhus exanthématique de Chang-Hai. [**Exanthematic Typhus at Shanghai.**]—*Bull. Soc. Path. Exot.* 1939. June 14. Vol. 32. No. 6. pp. 636–643. [14 refs.]

In the year 1938 there were over 1,000 cases of typhus fever in the four months March to June. The author believes that this was an epidemic caused by the murine virus and carried from man to man by the louse. *D. H.*

RAYNAL (J. H.), FOURNIER (J.) & VELLIOT (E.). **Research on Typhus in Shanghai.**—*Chinese Med. Jl.* 1939. July. Vol. 56. No. 1. pp. 11–28. With 6 charts. [15 refs.]

The author's conclusions are that

"The researches made on typhus fever in Shanghai lead to the conclusion that there exists under normal conditions a murine typhus, endemic in the rat and sporadic in man.

"Owing to exceptionally favourable circumstances [overcrowding with starving and lice infested refugees], the spring cases of 1938 gave rise to a mild epidemic outbreak (a thousand cases out of a population of three millions). [This is by far the greatest number of cases recorded in Shanghai in one year since statistics are available.]

"The louse is manifestly the carrier of this epidemic murine typhus.

"The strains of virus isolated from human cases, nearly related experimentally to that from rats, can nevertheless, especially in one case, be considered as intermediary types between rat virus and typical typhus virus.

"This would seem to indicate that under certain conditions, the rat virus, escaping from the 'rat-flea-rat' cycle, can attempt an adaptation to the 'man-louse-man' cycle, achieving *en route* various stages which mark its progress towards a historic typhus virus."

One of the authors (Raynal) states that he witnessed a similar epidemic in Guatemala (Tabardillo) and was struck by the analogies presented thereto by the Shanghai epidemic of 1938. *D. H.*

CLEAVE (T. L.). **Two Cases of Typhus Fever.**—*Jl. Roy. Nav. Med. Serv.* 1939. Oct. Vol. 25. No. 4. pp. 418–421. With 3 charts.

Two cases of typhus admitted to Royal Naval Hospital, Hong Kong, are described, neither had contracted the disease locally. The first case was severe and was complicated by haemorrhage from the bowel and infarct of the spleen. The Weil-Felix reaction was positive in both cases, in the severe case *Proteus OX19* was agglutinated in a dilution of 1/2800 and in the mild case to a dilution of 1/1400. In both cases guineapigs were inoculated with blood taken during the fever and gave a typical typhus reaction. *D. H.*

MASUCCI (U.). La terapia del tifo esantematico. [**The Treatment of Exanthematic Typhus.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1939. June. Vol. 20. No. 6. pp. 362–371.

Instructions as to diet and oral hygiene are in conformity with common practice in fevers. Mention is made of Nicolle's serum, which has been advised in the early stages, but the results reported have not been very favourable. Convalescent serum may be used, preferably intraspinally, in doses of 25 cc. Various metals have been tried but the author sums up these measures adversely and states that treatment is largely symptomatic. In prophylaxis the value of the vaccine of Weigl is appreciated.

For the toxaemia subcutaneous saline or glucose solution with 20–40 drops of 1/1000 adrenalin are advised to a total of 250–500 cc. daily. Tepid baths are used for hyperpyrexia. Strychnine, sparteine and coramine are given as cardiac stimulants, bromides for sedative purposes and in convalescence preparations of iron, arsenic and glycerophosphates together with the vitamin-containing foods or products. *C. W.*

GIUNTA (Giuseppe) & D'IGNAZIO (Camillo). Su di una nuova terapia del dermotifo. [**A New Treatment for Typhus.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1939. June. Vol. 20. No. 6. pp. 372–374.

In this short paper the authors repeat the main conclusions of the longer account already given of their method of treating typhus [see this *Bulletin*, 1939, Vol. 36, p. 989].

The haemorrhagic symptoms of the disease have points in common with scurvy, the nervous symptoms with beriberi and in addition to symptomatic treatment and drug treatment with mercurochrome, the authors give vitamin C intravenously as ascorbic acid, and vitamin B if the nervous system is affected, relieving pressure by lumbar puncture. No figures are quoted except that about 60 natives have been treated in this way in Addis Ababa, and the authors suggest a wide trial of their method. *C. W.*

JOANNON INFANTE (Jorge). Reacción de Weil-Felix clínica en la campaña contra el tifo exantemático. [**The Weil-Felix Reaction in an Antityphus Campaign.**]—*Bol. Oficina Sanitaria Panamericana.* 1939. Dec. Vol. 18. No. 12. pp. 1134–1137. With 5 charts.

The author describes a rapid microtest, called by him a "clinical reaction" for diagnosis of typhus. He obtains a drop of blood by finger-prick and takes it up on filter paper. This he places on a slide and adds a drop of physiological saline. After about 5 minutes he removes the paper leaving the serum and agglutinins. He then adds a small drop of antigen, *Proteus X19*, mixes the two and reads the result by naked eye.

During a period of 25 days (19th July–12th August, 1939) there were tested in this way 373 cases of fever, and the results are compared with laboratory tests of the same patients. In 334 the findings were the same; 37 recorded as negative by the "clinical reaction" were returned as positive by the laboratory. This is explained by saying that the agglutination was low, 1 in 200, in the former, and that the titre may rise rapidly, so that by the time the laboratory tests were made it has risen to a diagnostic value. Two others are recorded as "temporarily disagreeing"; these were found negative by the "clinical" test, whereas the laboratory reported positive at 1 : 320. Some days later repetition of the former confirmed the laboratory findings. A third was reported as positive by one laboratory, but was negative according to the author on two occasions; a fresh examination at the hospital laboratory confirmed the latter. One other was twice found positive by the author, but negative at the laboratory. Death occurred and blood taken from the heart post-mortem when tested in the laboratory gave a strong positive. [The value of agglutination with blood taken after death needs confirmation. An analogy, though not a parallel, was the experience of the reviewer. Blood taken at autopsy for carrying out the Wassermann reaction was tested by him in a large number of cases and invariably yielded a positive, though in life it might have given a negative finding.] It will be seen that no case found positive by the author's clinical test was returned a negative by the laboratory, except the last and that was reversed subsequently.

H. H. S.

LE RENARD (A.) & RAYNAUD (M.). Syndrome néphrotoxique suraigu du typhus exanthématique. Décapsulation du rein—guérison. [**Decapsulation of the Kidney in Typhus Nephritis.**]—*Arch. Méd. Gén. et Colon.* 1939. Vol. 8. No. 3. pp. 77–83. With 4 diagrams.

A case of typhus with marked nervous symptoms caused by a toxic nephritis is described: there was complete suppression of urine and the patient became moribund. An emergency operation was

performed and the right kidney was decapsulated; the flow of urine was re-established and the patient ultimately made a good recovery.

In the author's opinion the nervous symptoms, coma, etc., in typhus are due in the majority of cases to a toxic nephritis. *D. H.*

REITLER (Rudolph), BTESH (Simon) & MARBERG (Kurt). **Endemic Typhus in Palestine.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1939. July 28. Vol. 33. No. 2. pp. 197–212. With 1 chart. [21 refs.]

This paper gives a short survey of the epidemiological data on endemic typhus in Palestine as far as they are known at present. The conclusion is drawn that endemic typhus is mainly a disease of the non-immunized immigrants while the indigenous population is assumed to be more or less "silently immunized" in childhood. The clinical picture of endemic typhus in Palestine is fully described and two types of the disease are distinguished. Their characteristic differences may be summarized as follows:—

	Type 1.	Type 2.
Onset	Moderately severe.	Very severe.
Systemic reactions	,, ,,	Severe.
Rash	Bright colour, small spots confined to trunk.	Darker colour, large spots. Spreads from trunk to limbs and face.
Duration of disease	2–3 weeks.	10 to 12 days.
Weil-Felix reaction	*Proteus X19.*	*Proteus X19.*
Date of appearance	6th to 12th day.	12th to 14th day.
Titre	High.	Low.

D. H.

CASTANEDA (M. Ruiz) & SILVA (Roberto). **Varieties of Mexican Typhus Strains.**—*Public Health Rep.* 1939. July 21. Vol. 54. No. 29. pp. 1337–1345. With 1 fig. [14 refs.]

From October 1936 to January 1938, 69 cases of typhus were admitted to the General Hospital of Mexico City. Of these 46 were bled for inoculation into rats; these rats were later killed and emulsions of the brains inoculated into guineapigs. Thirty-eight such inoculations were made and produced 20 strains of typhus. Two of these strains showed the definite characteristics of murine strains, 8 were lost before definite diagnosis could be made, and the remaining 10 strains had all the characteristics of the European or historic epidemic virus, yet none of these cases were imported, all were contracted locally. There was no epidemic of typhus during the period but from these cases taken as they came in three types of virus were isolated: murine, intermediate and epidemic. *D. H.*

RUGE (H.). Zur Frage des sogenannten Schiffsfleckfiebers. [**The Question of So-called Ship Typhus.**]—Reprinted from *Deut. Milit.* 1939. Vol. 4. No. 5. pp. 224–227. With 4 figs. [16 refs.]

In 1933 an investigation in Hamburg showed that the sera of rats captured in the docks gave a positive Weil-Felix reaction and the emulsified brains of these rats infected guineapigs.

In 1937 a sailor from a ship in the harbour was admitted to hospital with fever ; the fever was mild and a profuse rash was noted all over the body. The serum of the patient when first tested gave a positive reaction in a dilution of 1/200 with Bang's bacillus but later gave a strong positive reaction for *Proteus OX2* although negative with *Proteus OX19*. Blood taken during the fever and injected into guinea-pigs produced fever and orchitis and Rickettsia were seen in films made from the tunica vaginalis.

The author claims that this is the first case of "ship typhus" recorded in Germany. As the last port of call of the vessel was a Spanish Mediterranean port infected rats may have boarded the ship there. *D. H.*

ROBERTS (J. I.). **Notes on Typhus Fevers in Kenya.**—*Jl. Hygiene.* 1939. July. Vol. 39. No. 4. pp. 345–354. With 11 figs.

The author has already shown that there is a type of typhus fever in Kenya which resembles boutonneuse fever. A primary sore is present and the disease is carried from the dog to man by the dog tick *R. sanguineus*. In the case described in the paper the serum agglutinated *Proteus OXK* but not *Proteus OX19*.

There is also another type of typhus fever without primary sore and resembling endemic typhus, which is carried by the rat flea from rat to man. Three cases are described and a murine typhus virus was isolated from rats and rat fleas captured in the brewery where the patients had been at work. *D. H.*

MAISTER (M.) ; MILLER (A.) ; GEAR (James) ; DE MEILLON (Botha). **Murine Typhus in Natal. I. Report of Occurrence of Case** [MAISTER & MILLER].—*South African Med. Jl.* 1939. Dec. 23. Vol. 13. No. 24. p. 803. **II. Laboratory Investigations** [GEAR & DE MEILLON].—*Ibid.* pp. 804–806. With 1 fig.

I. A young lady clerk employed in a rat infested grain store in Maritzburg developed fever with a profuse typhus rash. The Weil-Felix reaction became positive for *Proteus OX19* in a dilution of 1/320 and *Proteus OX2* 1/200. Three years before a similar case had occurred in another employee of the same store and had been diagnosed as "flea-borne" typhus.

II. (*a*) Rats were trapped in the store and killed and emulsion of the brains inoculated into guineapigs. These animals developed fever and scrotal reaction and numerous Rickettsia were seen in smears from the tunica ; these organisms were typical of the virus of endemic typhus.

(*b*) Fleas were collected from these rats and placed on a white rat. This animal was killed a fortnight later and emulsion of the brain was inoculated into a guineapig which developed fever and a scrotal reaction. Similar Rickettsia were also seen in smears made from the inflamed tunica.

(*c*) Blood was obtained from another case of endemic typhus acquired in the same store, the blood clot was inoculated into a guinea-pig and a strain of virus was isolated.

These three strains, from the rats in the store, from fleas collected from these rats and from a patient who had contracted his infection in the store were tested and it was found that they were immunologically similar. This is the first occasion on which the virus of murine typhus has been isolated from a case of fever in Natal. *D. H.*

LIU (Wei-T'ung) & CHUNG (Huei-Lan). **I. A Murine Typhus Virus isolated from a Patient in Peiping, China.**—*Proc. Soc. Experim. Biol. & Med.* 1939. Mar. Vol. 40. No. 3. pp. 350–353. [15 refs.]

A typhus virus was recovered from the blood of a patient with typhus fever and this virus was found to conform to the murine type not only in its behaviour in the guineapig but also in the rat and in the mouse. *D. H.*

LIU (Wei-T'ung) & CHUNG (Huei-Lan). **II. Typhus Virus isolated from Rats and Rat Fleas in Typhus Houses.**—*Proc. Soc. Experim. Biol. & Med.* 1939. Mar. Vol. 40. No. 3. pp. 353–355.

Five strains of typhus virus were isolated from rats and their fleas caught in the houses of two typhus fever patients who were suspected on clinical and epidemiological grounds to be suffering from the immune variety of the disease. *D. H.*

WOLFF (E. K.). **A Strain of Tropical Typhus recovered from Rat Fleas.**—*Ceylon Jl. Sci.* (Sect. D. Med. Sci.). 1939. Sept. 4. Vol. 5. Pt. 2. pp. 39–45. With 1 chart.

Rats were captured in the house of a man who had suffered from typhus fever; fleas were removed from these rats and killed and emulsified; 80 per cent. of these fleas were *X. astia* and 20 per cent. *X. cheopis*. The emulsion was inoculated into 2 guineapigs, one of these reacted with fever and typical scrotal reaction. This strain of virus was passaged to other guineapigs and to rabbits; the serum of the rabbits agglutinated *Proteus OX19* to a titre of 1/300. *D. H.*

PANG (K. H.). **Distribution of Murine Typhus Rickettsiae in Developing Chick Embryo.**—*Proc. Soc. Experim. Biol. & Med.* 1939. May. Vol. 41. No. 1. pp. 148–150.

Growth of murine typhus Rickettsia in Maitland culture was inoculated on to the chorio-allantoic membrane of fertilized eggs 10–12 days old. They were incubated at 34°C. for 8–9 days and then cultures on Zinsser's "tissue agar" media and Maitland flasks were made from the various tissues and organs of the embryo. Rickettsia were isolated from the local lesion on the membrane, and from all the visceral organs and the brain of the dying embryo. Cultures from the liver gave the best results, those from the brain and membranes were poor.

These results suggest that typhus Rickettsia of the murine type is able to produce a local lesion on the chorio-allantoic membrane as well as a generalized infection which often kills the embryo.

D. H.

CASTANEDA (M. Ruiz). **Experimental Pneumonia produced by Typhus Rickettsiae.**—*Amer. Jl. Path.* 1939. July. Vol. 15. No. 4. pp. 467–475. With 4 figs. on 1 plate.

Mice and rats infected with an orchitic strain of typhus virus by the nasal route developed haemorrhagic lesions in the lungs and Rickettsia were seen in cells lining the bronchi. These resembled the Mooser

cells of infected rats. Rabbits were also inoculated with the tunica washings of infected guineapigs by the intratracheal route and showed the same lesions in the lungs. As a result of these pneumonic lesions mice die in 96 hours and rats and rabbits in 72 hours. No pneumococci were recovered from the lungs, the actual cause of the pneumonic condition was the Rickettsia. *D. H.*

WOLFF (J. W.) & DE GRAAF (W.). Een geval van shoptyphus (X19-Rickettsiose) met dierpassage van het virus. [**A Case of Urban Typhus** (*Proteus X19*-**Rickettsiosis**) **with Animal Passage of the Virus.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1939. Nov. 21. Vol. 79. No. 47. pp. 2985–2992. With 4 figs. on 1 plate. English summary (3 lines).

Shop or urban typhus cases are not infrequent in Java and the patient's serum agglutinates the O form of *Proteus X19*. This reaction, so important for diagnosis, is apt to occur late in the disease when fever has subsided and the patient is convalescent. Attempts to transmit the disease by this time to animals are fruitless. Such animal passage can only be accomplished during the time when the temperature is raised. In the present case 4 guineapigs were inoculated intraperitoneally with 5 cc. of the patient's blood 9 days after his admission to hospital and 14 days from the beginning of symptoms. One of the guineapigs showed loss of weight 15 days after infection, fever on the 18th day (40·2°C.) and a weak scrotal reaction. Ten passages were made of the virus and the chief symptoms were, rise of temperature after an incubation of 7 to 11 days and the simultaneous appearance of the scrotal reaction. This was much more invariably present than in experimental guineapig infection with *Proteus XK* virus. Similar scrotal reactions may be given by *Sp. minus* and the bacillus of melioidosis (*Pf. whitmori*), but appear later than the beginning of fever, are much more intense and result in adhesion of skin and testicle. Film preparations to demonstrate Rickettsia were made from omentum, parietal peritoneum and tunica vaginalis. *W. F. Harvey.*

BLANC (Georges), MARTIN (L. A.) & BALTAZARD (M.). Comportement du virus de typhus murin chez le pou de l'âne, *Haematopinus asini* (Lin.). [**The Behaviour of Murine Typhus Virus in the Louse** *H. asini.*]—*C. R. Acad. Sci.* 1939. Sept. 18. Vol. 209. No. 12. pp. 492–493.

A donkey was infected by means of large intravenous doses of murine typhus virus ; the animal developed fever and it was possible to infect guineapigs from its blood. Lice (*Haematopinus asini*) were removed from the donkey during the fever and were emulsified and inoculated into guineapigs which became infected with murine typhus. The lice were not virulent during the inoculation period but after the 10th day and up to the 20th day after the inoculation of the donkey lice were capable of infecting guineapigs although the virus had disappeared from the blood of the donkey by the 10th day. Faeces of the lice were also found to be virulent for guineapigs. *D. H.*

BRAZZAVILLE : AFRIQUE EQUATORIALE FRANÇAISE. RAPPORT SUR LE FONCTIONNEMENT DE L'INSTITUT PASTEUR DE BRAZZAVILLE PENDANT L'ANNÉE 1938 [SALEUN (G.)]. pp. 43–46.—Fièvres exanthématiques. [**Exanthematic Fever.**]

The author describes a case of fever with a marked typhus-like rash and a primary sore. The serum agglutinated *Proteus OX2* in a dilution of 1/300 and *Proteus OX19* to 1/100 ; he considers that this case was one of boutonneuse fever. The patient owned a dog which was heavily infested with ticks and which slept in his room.

A monkey and guineapig were inoculated with the blood of the patient and showed evidence of infection, fever, and in the case of the monkey a rising titre of agglutination for *Proteus OX2*. *D. H.*

MACVICAR (Neil). **Tick-Bite Fever in Natives.** [Correspondence.]—*South African Med. Jl.* 1939. Sept. 23. Vol. 13. No. 18. pp. 691–692.

The author reports four native patients each of whom had a sore, arising from a tick bite, usually with a central black eschar, with enlargement of the corresponding glands and fever but without rash. The fever apparently lasted a few days only and headache was present in all. The patients were seen at Lovedale. *C. W.*

GEAR (James) & DE MEILLON (B.). **The Common Dog Tick** *Haemaphysalis leachi* **as a Vector of Tick Typhus.**—*South African Med. Jl.* 1939. Dec. 23. Vol. 13. No. 24. pp. 815–816. With 2 figs.

Cases of tick bite fever have continued to be met with in the Witwatersrand in people associated with tick infested dogs. On at least three occasions ticks, *H. leachi*, removed from these dogs when inoculated into guineapigs have produced fever and scrotal reaction ; this strain of virus was successfully established and transmitted for several generations. In smears made from the tunica of the infected guineapigs Rickettsia similar in morphology and cytoplasmic distribution to those of tick bite fever were observed. Cross immunity experiments proved this strain to be immunologically similar to strains isolated from human cases. Experiments have now been carried out which show that *H. leachi*, the dog tick, is capable of transmitting the infection while biting and feeding. The ticks were collected from a dog belonging to a patient who was suffering from tick bite fever ; these ticks were allowed to feed on a guineapig to which they remained attached for 3 days ; on the 4th day the guineapig developed fever and small primary sores developed at the sites of the bites, and the inguinal glands became enlarged and tender. In smears made from the tunica vaginalis of the infected guineapigs Rickettsia were observed which resembled the Rickettsia of tick bite fever and in some cells the organisms were observed within the nucleus. Guineapigs recovered from infection with the virus of tick bite fever were immune to inoculation with this strain and *vice versa*. On the other hand guineapigs recovered from infection with this virus were not protected against typhus virus nor did infection with typhus virus (endemic or epidemic) protect guineapigs from this virus of tick bite fever [see also this *Bulletin*, 1939, Vol. 36, pp. 996, 997]. *D. H.*

TOPPING (Norman H.). **Experimental Rocky Mountain Spotted Fever and Endemic Typhus treated with Prontosil or Sulfapyridine.**—*Public Health Rep.* 1939. June 30. Vol. 54. No. 26. pp. 1143–1147. With 3 charts.

Guineapigs were used for these tests; 3 sets of 4 guineapigs were employed for each drug under test in each of the two rickettsial diseases.

One set of four guineapigs received the drug alone, one set was inoculated with infectious material and given daily doses of the drug and one set was inoculated with the infectious material alone.

No toxic symptoms were noted in the animals which received the drug alone. In guineapigs infected with passage virus of Rocky Mountain spotted fever and endemic typhus and treated with prontosil no benefit could be demonstrated. This was also true with sulphapyridine in spotted fever. *D. H.*

WOLFF (J. W.) & DE GRAAF (W.). Twee nieuwe gevallen van mijtekoorts op Java. [**Two New Cases of Mite Fever in Java.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1939. Sept. 26. Vol. 79. No. 39. pp. 2434–2441. With 2 figs. [13 refs.] English summary (9 lines); Oct. 3. No. 40. pp. 2527–2532. With 2 figs. on 1 plate. English summary (8 lines); Oct. 10. No. 41. pp. 2577–2588. With 5 figs. on 2 plates. [15 refs.] English summary.

i. *Clinical and epidemiological study* (pp. 2434–2441).

Cases of mite fever in the densely populated, highly cultivated island of Java are rare, whereas numerous cases have been reported from the east coast of Sumatra. In the present instance the two patients were soldiers who had contracted the disease during military exercises and night duty in scrub jungle or primeval forest. Both presented the same symptoms—fever with rigor, pain in the loins, headache, constipation and want of appetite. One of these patients had a small ulcerative lesion on the upper abdominal wall which was not painful and which he attributed to an insect bite. An enlarged lymph node was present in the axilla. His illness grew worse after admission and a measles-like rash made its appearance. Both Widal and Weil-Felix reactions were negative to begin with, as was the examination of a thick-drop film for malaria; bile blood culture remained sterile. Later on the Weil-Felix agglutination with *Proteus OXK* was positive at 1/200 and again at 1/400, which were not very high titres. This patient recovered; the other died of bronchopneumonia. Guineapigs were inoculated with the blood of both patients, and all became ill on the 10th day and died. Large numbers of Rickettsia were evident in the smears from the serous membranes. The opportunity was taken to examine the blood of 100 labourers of the neighbourhood but any positive serum titres obtained were low except in one individual with agglutination to *Proteus OX19* of 1/800 and this was ascribed to a shop typhus infection which is common in Java.

ii. *Laboratory study* (pp. 2527–2532).

"A Rickettsia strain from a case of mite fever in Java has been successfully cultivated through several passages in white mice and guinea pigs. The cultivation of this strain on the chorio-allantoic membrane of the developing egg also succeeded. This Javanese strain showed no

differences in virulence and animal reactions from the Sumatran strains of mite-fever and scrub-typhus and gave cross immunity reactions as compared with the Malayan ' Seerangayee ' scrub-typhus strain."

iii. *Study in Field Rats* (pp. 2577–2588).

These further investigations into the mite fever infection acquired by two soldiers in Java may be summarized as follows :—

" A search was made for the virus of mite-fever (scrub-typhus) in field rats (*R. rattus brevicaudatus*) caught in the neighbourhood of the area where two human cases of mite fever (see above) acquired their infection. The result was negative . . . . In the course of these investigations some guineapigs, infected with rat-brain-suspensions, reacted with fever and a scrotal reaction, although no Rickettsiae were detected." A number of experimental infections were carried out on field rats by intraperitoneal injections of *Proteus XK*-virus, using virulent suspensions of guineapig brain. The object was to determine how long these animals could remain carriers. None of the animals showed objective symptoms ; they were killed at different intervals. Giemsa preparations of the serous membranes, in rats killed after 11 and 18 days, showed Rickettsia in the endothelial cells, after which time they were absent. Infection of mice and guineapigs with suspension of rat brains showed positive infections up to the 38th day, " which proves that field rats are able to act as a virus reservoir for mite fever."

W. F. Harvey.

DELAND (C. Mervyn). **Endemic Typhus in New Guinea.** [Correspondence.]—*Med. Jl. Australia.* 1939. July 8. 26th Year. Vol. 2. No. 2. p. 82.

This letter refers to an article by GUNTHER and SCHROEDER in the *Medical Journal of Australia* of May 6th. The writer states that the previous cases of typhus referred to in that article all gave a positive Weil-Felix reaction for *Proteus OXK* 1/1280, the cases were mild and no primary sores were noted [see this *Bulletin*, 1939, Vol. 36, p. 1000].

D. H.

ROTON. Note sur un cas de typhus endémique originaire de l'Annam. [**Note on a Case of Endemic Typhus in Annam.**]—*Rev. Méd. Française d'Extrême-Orient.* 1939. Mar. No. 3. pp. 294–298. With 1 chart.

A very severe case of fever with a definite primary sore and the following complications—typhoid state, infarction in the lung followed by abscess, pleurisy, pneumothorax, paralysis of the intestine and of the bladder—complete recovery. The Weil-Felix reaction was negative. The case was probably Japanese river fever. *D. H.*

DELBOVE (P.). Les fièvres typho-exanthématiques en Indochine méridionale. [**Typhus in Southern Indo-China.**]—*Bull. Office Internat. d'Hyg. Publique.* 1939. July. Vol. 31. No. 7. pp. 1220–1224. [21 refs.]

Two types of typhus are met with—one is endemic or murine typhus and the other belongs in the tsutsugamushi group of fevers.

D. H.

MORISHITA (Kaoru). **Further Notes on the Epidemiology of Tsutsugamushi Disease in Formosa.**—*Taiwan Igakki Zassi* (*Jl. Med. Assoc. Formosa*). 1939. Oct. Vol. 38. No. 10. [In Japanese pp. 1471–1484. English summary p. 1484.]

The number of cases of fever noted during the period 1933–38 was 166. As regards seasonal prevalence the peak was in July. Among these cases 107 were Japanese, 44 Formosan Chinese and 10 aborigines. There were 138 males and 28 females. There was a 12 per cent. case mortality over all and among the Chinese cases the mortality was 20·4 per cent. and in the Japanese 10·3 per cent. *D. H.*

JOLLY (A.) & DI RUGGIERO. Sur un cas de fièvre typho-exanthématique observé à la Guadeloupe. [**A Case of Typhus in Guadeloupe.**]—*Bull. Soc. Path. Exot.* 1939. July 12. Vol. 32. No. 7. pp. 703–706.

A severe case of a fever of the typhus group with a marked rash which involved the hands and feet but not the face. The Weil-Felix reaction was positive in a dilution of 1/2500 for *Proteus OXK*. There was no primary sore. *D. H.*

LE COSQUINO DE BUSSY (Ivonne J.) & VAN LOGHEM (J. J.). X (Rickettsia) componenten in Nederlandsche stammen van *Proteus vulgaris* en *Proteus anindologenes*. [**X (Rickettsia) Components of *P. vulgaris* and *P. anindologenes*.**]—*Nederl. Tijdschr. v. Geneesk.* 1939. Dec. 30. Vol. 83. No. 52. pp. 6012–6019. English summary (10 lines).

"The authors have agglutinated 19 strains of Proteus vulgaris (indologenes) and 33 strains of Proteus anindologenes, grown in Holland from noses of patients with ozaena, from faeces, etc., against sera of shop-typhus and scrub-typhus originally from Sumatra. These strains with shop-typhus sera gave only negative or weak reactions (not over 1 : 250), but with scrub-typhus sera the results varied from negative to dilutions 1 : 10,000, which is a support for the hypothesis that in every Proteus strain an X component is inherent. A remarkable finding was the positive reaction (in one up to 1 : 10,000) of two *indologenic* strains with *scrub-typhus* serum.

"In absorbtion tests by the method of Castellani the strongly agglutinated strains withdrew the Rickettsia-agglutinins completely from the scrub-typhus sera."

LAIGRET (Jean) & DURAND (Roger). La vaccination contre le typhus exanthématique. Nouvelle technique de préparation du vaccin : emploi des cerveaux de souris. [**Mouse Brain in the Preparation of Typhus Vaccine.**]—*Bull. Acad. Méd.* 1939. July 11. 103rd Year. 3rd Ser. Vol. 122. No. 26. pp. 84–89.

The vaccine used previously by the writers was a dried virus prepared from the brain of infected guineapigs and englobed in yolk of egg.

It has been found that it is not possible to titrate the dose of virus in such a vaccine. It has now been found that if mice instead of guineapigs are employed the dose of virus can be directly measured and the virus stabilized or fixed as is the virus in yellow fever.

If the virus is passaged from brain to brain in mice the virulence is much increased and paralysis is produced in the mice, but for purposes

of vaccine preparation brain peritoneum passage is utilized and a titrated brain vaccine with the virulence always equal and controlled can be produced. This virus can be kept for 95 days in the refrigerator and for at least 7 days at room temperature. Seven thousand people have now been successfully vaccinated with the mouse brain vaccine, as a rule it is only possible to give one dose of vaccine but 3 doses should be given when possible. *D. H.*

LAIGRET (J.) & DURAND (R.). La vaccination contre le typhus exanthématique en Tunisie. Modifications apportées à la technique de préparation et d'inoculation du vaccin. [**Technique employed in Vaccination against Exanthematic Typhus in Tunis.**]—*Bull. Soc. Path. Exot.* 1939. July 12. Vol. 32. No. 7. pp. 735–751.

The typhus vaccine previously used by the authors in Tunisia was prepared from the brains of rats and of guineapigs infected with murine typhus virus. Although this vaccine has been used on a large scale and successfully the great drawback has been that the amount and the degree of virulence of the virus in the dose of vaccine could not be accurately measured. The authors have found that if mice are inoculated intraperitoneally from rats and the murine virus is passaged intracerebrally in the mice the virus produces paralysis and death in a definite period of time, and a fixed virus can be obtained comparable with that of yellow fever. The procedure is now to inoculate the mice intraperitoneally and to employ the brains of these animals in the place of guineapig or rat brains in the production of vaccine. The amount of the virus in the mouse brain can be accurately titrated by injection into series of mice, the minimal amount capable of producing paralysis being taken as the unit of virulence. It has been found that one brain will contain from 1,000 to 10,000 units and one brain yields 1,000 doses of vaccine.

In the preparation of the vaccine the mouse brain is emulsified in 40 cc. of yolk of egg, it is then dried and kept in the refrigerator while being tested for virulence and later suspended in distilled water for inoculation. This vaccine retains its virulence in the refrigerator for three months and at room temperature at least one week. Seven thousand vaccinations have already been carried out with the new vaccine, the great advantage of which is that the amount and virulence of the virus in a dose of vaccine can now be accurately titrated.

D. H.

SPARROW (Hélène). Abondance des rickettsias du typhus murin cultivées dans les poux. [**Abundant Growth of Murine Rickettsia in the Louse.**]—*Rev. d'Immunologie.* Paris. 1939. Sept. Vol. 5. No. 5. pp. 462–468. With 6 charts.

Lice were infected by the anal route with the virus of murine typhus Tunis No. 1. Very heavy growths were obtained in the lice and the intestines were emulsified and diluted to high titres so that minimal doses could be injected intraperitoneally into rats and guineapigs from 1/1000th of an intestine to 10,000 millionth. The latter dose was capable of producing infection as shown by fever and scrotal reactions and by the production of a solid immunity. *D. H.*

SPARROW (Hélène) & MARESCHAL (Pierre). Réaction de l'organisme humain à l'inoculation des rickettsias du virus typhique murin I de Tunis. [**Human Reaction to Murine Rickettsia Inoculation.**]—*Rev. d'Immunologie.* Paris. 1939. Sept. Vol. 5. No. 5. pp. 469–475. With 8 charts.

The authors repeated their previous experiments of inoculation and instillation of the virus of typhus murine Tunis No. 1 into human beings but on this occasion, however, employed as inoculum the intestinal contents of infected lice in place of emulsions of brain of infected guineapigs and rats.

When instilled into the conjunctiva of a mental patient a dose consisting of the contents of the intestine of one infected louse produced a mild fever which lasted about a week ; there were no other symptoms of any kind but the Weil-Felix reaction became positive and a solid immunity was produced. Similar results were obtained when the subcutaneous route was employed but there was a marked difference in the severity of the disease, in fact a typical case of typhus resulted. However, this could be minimized by regulation of the size of the dose.

The authors insist that if it is intended to produce immunity by means of injection of living virus it is necessary to produce an infection although this infection may only be demonstrated by a rise in the titre of the Weil-Felix reaction. The authors also affirm that laboratory animals and particularly the rat are more sensitive to the murine virus than is man. *D. H.*

PINKERTON (Henry) & BESSEY (Otto A.). **The Loss of Resistance to Murine Typhus Infection resulting from Riboflavin Deficiency in Rats.**—*Science.* 1939. Apr. 21. N.S. Vol. 89. No. 2312. pp. 368–370.

Five rats which had been fed on a diet deficient in riboflavin were injected with typhus virus ; all of them died and at post-mortem a profuse peritoneal exudate was found and the cells in the exudate contained masses of Rickettsia.

Two rats fed on a diet deficient in vitamin A were also injected but did not die and only slight exudate was found on examination. The former method might prove useful in obtaining material for vaccines.

D. H.

COX (Herald R.). **Rocky Mountain Spotted Fever. Protective Value for Guinea Pigs of Vaccine prepared from Rickettsiae cultivated in Embryonic Chick Tissues.**—*Public Health Rep.* 1939. June 16. Vol. 54. No. 24. pp. 1070–1077.

An emulsion was made of the infected embryonic tissue in saline and the virus was killed by the addition of carbolic acid 0·4 per cent. and formalin 0·1 per cent. The emulsion was then centrifuged and the supernatant fluid used as a vaccine. It was found possible to prepare 1,000 cc. of vaccine from two 10 day old embryos. A single 1 cc. injection of the vaccine was sufficient to protect a guineapig from a test dose of a virulent strain of the Rocky Mountain fever virus.

D. H.

BLANC (Georges) & BALTAZARD (Marcel). Recherches sur la durée de l'immunité conférée à l'homme par l'infection fébrile ou inapparente de typhus murin. [**The Duration of Immunity due to Febrile or Inapparent Infection with Murine Typhus.**]—*C. R. Acad. Sci.* 1939. Aug. 28. Vol. 209. No. 9. pp. 419–420.

Conclusions. 1. An attack of murine typhus with fever gives regularly a perfect immunity against murine typhus and also against epidemic typhus for at least 5 years.

2. An inapparent infection with murine typhus produced by bile treated vaccine or otherwise gives also an immunity of the same value and duration.

3. It is possible to conclude that even if every person inoculated with bile treated vaccine is not immunized, certainly all those who have had an inapparent infection following vaccination are immunized and for a considerable period—4 or 5 years. For this reason if vaccination is regularly performed in endemic areas the infection ought to disappear rapidly. The authors quote cases in support of their conclusions.

D. H.

KAWAMURA (R.), KASAHARA (S.), TOYAMA (T.), NISHINARITA (F.) & TSUBAKI (S.). **On the Prevention of Tsutsugamushi. Results of Preventive Inoculations for People in the Endemic Region, and Laboratory Tests with the Pescadores Strain.**—*Kitasato Arch. Experim. Med.* 1939. May. Vol. 16. No. 2. pp. 93–109.

The Pescadores strain of tsutsugamushi fever was passaged in the testicles of rabbits for 181 generations; the inoculation of testicular emulsions produced only mild fever in man.

Thirty-one volunteers were inoculated, all showed well marked local reaction and mild fever with the exception of one man who had had tsutsugamushi fever previously; he did not react in any way.

The majority of these persons afterwards worked daily in the endemic area and none contracted fever although they were actually bitten by akamushi and cases of fever occurred among the unprotected. Injections of the Pescadores virus immunized mice against the virulent Niigata strain. The authors are convinced that the Pescadores strain may be used for general preventive measures against tsutsugamushi fever in the endemic regions [see also this *Bulletin*, 1939, Vol. 36, p. 1000]. *D. H.*

KAWAMURA (Rinya) & UEDA (Morinaga). **On the Treatment of General Paresis with the Pescadores Strain of Tsutsugamushi Virus.** —*Kitasato Arch. Experim. Med.* 1939. Sept. Vol. 16. No. 3. pp. 183–196. [18 refs.] [Summary appears also in *Bulletin of Hygiene.*]

In contrast to Japanese tsutsugamushi fever, or Japanese river fever, which has a mortality of 30 to 50 per cent., the Pescadores strain is safe, as in 113 cases inoculated with it there was no serious event. The authors present in this paper evidence that inoculation with Pescadores tsutsugamushi has distinct advantages over malarial inoculation in the treatment of G.P.I.

The original virus for the present research was obtained from a patient's blood and subsequently subinoculated into rabbits' testicles

over 180 times. Ten per cent., gauze-filtered, emulsions of infected testicles were used for inoculation of the paretic patients, 0·5 to 1·0 cc. being injected intramuscularly into the upper arm or the thigh. Alternatively, sometimes blood of a patient with fever was injected intravenously. After intramuscular injection there is pain and reddening at the site for 3 to 7 days, and after an incubation period of 2 to 10 days (average 7) the temperature begins to rise, reaching a maximum of 102·2°F. in 2 or 3 days and beginning to descend by lysis after about 10 days, the total febrile period being about two weeks. An eruption of light, reddish-brown non-haemorrhagic papules on the face, body and extremities is usual, and the rash on the face may be so thick as to make this oedematous. General symptoms are mild. The symptoms following inoculation with infected human blood were similar but the incubation was longer. Of 20 cases of G.P.I. treated by this virus, 8 made a complete recovery, 9 were improved, 2 showed no change and 1 died. The authors compare these results with those published by different authors after malarial inoculation and conclude they are better. They quote the following: GERSTMANN, recovery in 47·25 per cent. of 400 cases followed for 2 to 7½ years (complete recovery in 33 per cent.). NONNE, 322 cases, recovery in 67·8 per cent. (complete in 29 per cent.). WEYGANDT, 329 cases followed for 15 months, recovery in 44·08 per cent. SHIOYA studied reports of 2,613 cases and found a recovery rate of 54·9 per cent. (complete in 28·6 per cent.). The authors claim 86·0 per cent. recoveries (40 per cent. complete) and that therefore their method is superior to, or at any rate comparable, with the malarial. [But results in 20 cases cannot be compared closely with those in the hundreds or thousands of all degrees of severity reported in the literature.] The authors claim advantages for this method in its relative safety, which compares with a mortality of 10 to 20 per cent. under malaria. Further the virus is transmitted naturally only by the bite of *Trombicula akamushi* which has a limited distribution so that accidental cross-infection is unlikely. A further advantage is that a supply of the virus can be maintained easily in rabbits' testicles; emulsion of this, if kept at 3 to 5°C., retains its virulence for as long as 13 days [see also this *Bulletin*, 1938, Vol. 35, p. 374]. *L. W. Harrison.*

BARTONELLA INFECTIONS, DENGUE AND SANDFLY FEVER.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

PATIÑO CAMARGO (p. 271) describes the clinical features of an outbreak of bartonellosis in Colombia, hitherto unaffected by this disease. The fatality rate was high. LAWKOWICZ (p. 271) cultivated *Bartonella muris* on a semi-solid agar medium. Sera of animals immunized with Bartonella agglutinated Rickettsia and gave positive Weil-Felix reactions.

TYZZER and WEINMAN (p. 272) describe Bartonella from the field vole and suggest a new classification of the genus Bartonella.

WAKIL and HILMY (p. 273) consider the epidemic of dengue in Cairo in 1937–38 to have been due to missed sporadic cases infecting a population rendered susceptible through long absence of the disease. PANDIT and SHORTT (p. 273) show that the virus of dengue persists in the blood for 40 days during convalescence; neutralizing bodies are

found but convalescent sera will not neutralize the virus of sandfly fever. LE GAC and SERVANT (p. 273) show that the headache of dengue is due to increased tension in the cerebrospinal fluid and that immediate relief can be obtained by lumbar puncture.

PANDIT *et al.* (p. 274) show that the virus of sandfly fever is present regularly in the blood for 7 days. Virus cultivated on fowl embryo was found to be non-pathogenic for animals and was used as a vaccine in man in a trial experiment. ANDERSON (p. 274) studied the sandflies of Peshawar and records the results of attempts at control with insecticidal oil and spray. LE GAC *et al.* (p. 275) describe the cerebrospinal fluid in sandfly fever. PIRUMOV and ANANJAN (p. 275) attempted immunization by injecting infected blood mixed with convalescent serum. *C. W.*

PATIÑO CAMARGO (Luis). Un nuevo foco de bartonellosis en América. (Nota preliminar.) [**A New Focus of Bartonellosis in (South) America.**]—*Bol. Oficina Sanitaria Panamericana.* 1939. Apr. Vol. 18. No. 4. pp. 305–313. With 3 figs. (1 map).

In 1936 the authorities were disturbed by reports of a serious outbreak of disease in Guáitara valley, in southern Colombia near the Ecuador boundary. The disease was named Guáitara fever, and was characterized by an acute onset with intense pains, headache, backache and arthralgia, with marked debility, rapid pulse, dyspnoea, and anaemia. Some patients had epistaxis and haemorrhagic eruptions, and a few cough, vomiting, hebetude to stupor, and delirium preceding death. This might take place as early as the fourth day or as late as the eighty-seventh ; others might remain in a precarious state and begin to convalesce in the eighth to tenth week. As a rule, but not invariably, those who survived the earlier days developed a verruga-like rash between the 30th and 60th day after the febrile onset, mostly on the face and exposed parts, rarely on the mucosae. The anaemia was marked, red cells being soon reduced to 1,300,000 or even less per cmm. The fatality rate was high ; some districts with an average in normal times of 8 deaths a month might register 64 ; in the first nine months of 1938 there died 1,800 persons from this disease.

It will be seen that the symptoms are typical of Oroya fever and verruga peruviana, and examination of blood smears revealed Bartonella and the diagnosis was confirmed by animal inoculation and by culture. Phlebotomus was not seen, but Ornithodorus, Amblyomma, lice and fleas are common.

Hitherto bartonellosis has been recorded in Peru, Bolivia, Chile and Ecuador and to these must now be added Colombia. *H. H. S.*

LAWKOWICZ (W.). **Researches on *Bartonella muris* and its Cultivation *in vitro*.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1939. Feb. 28. Vol. 32. No. 5. pp. 601–604. With 4 figs. on 1 plate.

The medium employed in this investigation was the semi-solid agar of Noguchi made with tap water instead of saline, as follows :—

Sterilized tap water	80 cc.
Defibrinated rabbit blood	3 cc.
Fresh rabbit serum	10 cc.
Nutrient agar 2 per cent. (*p*H 7·4)	10 cc.

The blood of splenectomized white rats was used as inoculum. Two strains of Bartonella were isolated in culture ; growth appeared

from the 6th to the 12th day. After several subcultures the parasites could be grown on the surface of chocolate agar, colonies appearing after 48 hours incubation. The organisms when stained appeared as minute ovoid cocci and clusters of delicate rods; on chocolate agar at 37°C. they appear as wavy threads. They are non-motile and Gram negative. Three-weeks-old rats were found to be non-infected and when these were inoculated with culture materials they developed anaemia, and adult rats treated with arsenobenzol to remove infection and then inoculated with culture developed severe anaemia. Complement fixation tests with cultures and sera of rats were positive.

Emulsions of Rickettsia were agglutinated by sera of rats and rabbits which had been immunized with Bartonella cultures, also a positive Weil-Felix reaction was obtained in rats and rabbits. *D. Harvey.*

TYZZER (Ernest Edward) & WEINMAN (David). *Haemobartonella,* **n. g.** (*Bartonella olim* **Pro Parte**), *H. microti,* **n. sp., of the Field Vole,** *Microtus pennsylvanicus.—Amer. Jl. Hyg.* 1939. Nov. Vol. 30. No. 3. Sect. B. pp. 141–157. With 2 text figs. & 10 figs. on 1 plate. [28 refs.]

In an earlier paper Tyzzer has described 7 different types of blood parasites in the common field vole. These included trypanosomes, haemogregarines, Babesia, Bartonella and Grahamella-like parasites.

From a large sample of voles locally captured Bartonella infection was demonstrated after splenectomy in practically every single animal.

These parasites were extremely polymorphic and slender rods, coarse filaments, ring forms and coccoid bodies were all seen. It might be argued that some of these forms represented other parasites of the vole such as Eperythrozoon but when the blood of the infected vole was inoculated into splenectomized white mice, the same forms of the Bartonella appeared.

In view of the polymorphism of this parasite it is proposed that this is a new species and should receive the name of *Haemobartonella microti*; it is also suggested that the genus Bartonella should be divided into two, Bartonella and Haemobartonella—(1) Bartonella, type species *bacilliformis,* the cause of Oroya fever, which multiplies within cells other than blood cells such as venous endothelium and which produces wart-like or nodular skin eruptions; (2) Haemobartonella, new species, applying the name to those Bartonella in which there is no demonstrable multiplication outside the blood and which does not produce cutaneous eruptions. *Haemobartonella microti* was readily cultivated on Noguchi's semi-solid serum agar. *D. H.*

JARAMILLO (Raúl). Contribución al estudio de la bartonellosis en Colombia. (Enfermedad de Carrión.) [**Carrión's Disease in Colombia.**]—*Rev. de Hig.* Bogota. 1939. Aug. Vol. 20. No. 8. pp. 13–70. With 10 charts & 5 figs. [75 refs.]

This is a thesis for the local doctorate of medicine. It reviews the subject of human bartonellosis with brief details of 23 cases observed personally by the author. Except that it states the parts of Colombia in which the disease has been found to occur, there is no fresh information beyond what is given in text-books dealing with Oroya fever and verruga peruviana. *H. H. S.*

WAKIL (A. W.) & HILMY (F.). **The Dengue Epidemic of 1937 in Cairo.**—*Jl. Egyptian Med. Assoc.* 1938. Nov. Vol. 21. No. 11. pp. 716–737. With 4 charts. [28 refs.]

This epidemic of dengue has already been referred to in this *Bulletin*, 1939, Vol. 36, p. 482.

Two thousand five hundred and ninety-four cases were reported in 1937–38 and 92 per cent. of these occurred in the city of Cairo. The writers are of opinion that the infection was not imported into Egypt but that the epidemic arose from missed sporadic cases in September; owing to the long interval since the last epidemic in 1928 there were many susceptible people.

There was no undue prevalence of *Aëdes aegypti* in Cairo during the autumn of 1937 but this mosquito was readily found in houses where cases were occurring. An intensive anti-mosquito campaign was carried out in the city by means of anti-mosquito brigades. *D. H.*

GERGAWY (Iskandar F.). **The Epidemics of Dengue Fever in Egypt in 1927–1928 and 1937.**—*Jl. Egyptian Med. Assoc.* 1938. Dec. Vol. 21. No. 12. pp. 796–812. With 9 charts.

Cases in the epidemic of 1928 are compared with cases seen in the epidemic of 1937. Charts and clinical notes are given for 3 cases in 1928 and 6 in 1937. Little difference is noted. *D. H.*

MADRAS: REPORT OF THE KING INSTITUTE, GUINDY, FOR THE YEAR ENDING 30TH SEPTEMBER, 1938 [SHORTT (H. E.), Director]. pp. 38–39.—**VI. The Filterable Viruses Enquiry** [PANDIT (C. G.) & SHORTT (H. E.)].

The dengue fever virus has already been cultivated in this laboratory on chorio-allantoic membrane. A small outbreak of the disease in St. Thomas Mount provided an opportunity for further study of the virus. The virus was found to persist in the blood for 40 days during convalescence. The presence of neutralizing bodies was also demonstrated. It was also found that the dengue fever convalescent sera did not neutralize the sandfly fever virus. *D. H.*

LE GAC (P.) & SERVANT (J.). Contribution à l'étude de la ponction lombaire et des modifications du liquide céphalo-rachidien au cours de la dengue. [**The Spinal Fluid in Dengue.**]—*Bull. Soc. Path. Exot.* 1939. Nov. 8. Vol. 32. No. 9. pp. 888–893. With 1 fig.

In cases of dengue hypertension of the cerebrospinal fluid is the cause of severe and intractable headache, stiffness of the neck, pain in the back and slow pulse; this headache is as a rule not relieved by drugs which are useful in other diseases. On lumbar puncture clear fluid under considerable pressure flows out and this gives immediate relief to the symptoms mentioned above. There is also less weakness after the fever in cases so treated, and in 3 or 4 days after the fever patients can resume their work. As regards the fluid itself, examination shows that there is some increase in the albumen content (not so great as in sandfly fever), considerable increase in sugar content, no increase in chlorides and no marked cellular reaction. *D. H.*

MADRAS: REPORT OF THE KING INSTITUTE, GUINDY, FOR THE YEAR ENDING 30TH SEPTEMBER, 1938 [SHORTT (H. E.), Director]. pp. 31–32.—**III. Further Observations on the Virus of Sandfly Fever** [PANDIT (C. G.), RAO (R. S.) & SHORTT (H. E.)].

During the year over 150 samples of sera collected during the febrile and convalescent stages from cases of sandfly fever were studied for their virus content. It was noted by the egg inoculation technique that the virus was present in the blood regularly for 7 days. The virus is now at its 64th passage on the chorio-allantoic membrane. It was found that this cultivated virus was non-pathogenic for monkeys and other laboratory animals, it was decided therefore to use it as a vaccine for human volunteers. Eight volunteers received the vaccine in 2 doses at an interval of 1 week; 8 others were treated with normal saline as controls—no untoward results followed and the presence of the virus in the sera of the volunteers was demonstrated. Later both the control and the test volunteers were inoculated with pooled sera from cases of sandfly which had previously been tested for presence of virus.

Results.—Out of 6 test volunteers 3 escaped infection, 2 had a mild attack and 1 had a typical attack. Out of 7 in the control group 2 had typical attacks and 5 escaped infection. The attacks in the control group were much more severe than in the inoculated group. *D. H.*

ANDERSON (W. M. E.). **Observations on *P. papatasii* in the Peshawar District. Part I.**—*Indian Jl. Med. Res.* 1939. Oct. Vol. 27. No. 2. pp. 537–548. [10 refs.]

The author presents the results of an investigation on sandflies (*Phlebotomus papatasi*) at Peshawar, N.W.F., in the hot weather of 1938. It appears that the adult insects were abundant from the end of March to the end of October. A considerable number of generations must have been produced for the insects passed through a complete cycle in one month in the laboratory in the hot weather, and even in September and October the cycle only occupied two months. The adults appear to be equally abundant on the upper and lower floors of a two-storey bungalow, as was shown by hand catching and trapping at light. A somewhat primitive wind tunnel was constructed, and observations made with it seem to show that the insect could make headway against a wind up to 1·6 miles per hour.

An attempt was made to control the insect by applying naphthalene dissolved in cheap kerosene to certain spots in the soil. Forty gallons of this, at a cost of 1 rupee per gallon, were used to treat an area within 120 yards of an isolated building. The author could get no evidence that this had reduced the number of sandflies or of cases of sandfly fever. [This appears to suggest that in the present state of knowledge it would pay to devote attention to the exact determination of breeding places, making use of modern methods for extracting insects from considerable samples of soil. One might then concentrate more precisely on breeding places and measure the effectiveness of treatment by counting the larvae in soil before and after the applications.] The author also sprayed a barrack room with 5 per cent. lethane 384: this produced a great reduction in the number of flies as much as 4 days later, though it was not determined to what extent this was due to the repellent and to the toxic actions of the insecticide.

[It is not clear from the text how many identifications were made by the tedious but precise method of examining microscopic characters, nor whether other large species superficially resembling *P. papatasi* occurred in the area.] *P. A. Buxton.*

LE GAC (P.), SAMARA (M.) & SERVANT (J.). Nouvelle contribution à l'étude des modifications du liquide céphalo-rachidien au cours de la fièvre à pappataci. Hypertension méningée. Réaction de Guillain. [**New Contribution to the Study of the Modifications of the Cerebrospinal Fluid in the Course of Sandfly Fever.**]—*Bull. Soc. Path. Exot.* 1939. May 10. Vol. 32. No. 5. pp. 473–477. With 3 figs.

The fluid is clear but under very considerable pressure. The albumen content is always very high in contrast with the few lymphocytes seen. In the reaction of Guillain tubes 5, 6, 7 and 8 show benzoin colloidal precipitation without any modification of the other tubes [see this *Bulletin*, 1939, Vol. 36, p. 253 for the colloidal benzoin reaction].

D. H.

PIRUMOV (Kh. N.) & ANANJAN (S. A.). **Results of an Attempt of Immunization from Sand-Fly Fever.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1939. Vol. 8. No. 2. [In Russian pp. 235–241. English summary p. 242.]

The virus employed was the blood of patients with sandfly fever: this was mixed with the serum of convalescents from the disease and injected; 230 persons were treated in this way and the percentage subsequently infected in this group during the epidemic season was 27 whereas in one untreated control group 84 per cent. contracted the disease. *D. H.*

CHOLERA.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

PASRICHA *et al.* (p. 276) have studied the serological behaviour of 438 vibrios from cases of cholera. AHUJA and SINGH (p. 277) record their experiments with 219 strains of vibrios from cases of cholera, healthy persons and from water, all inagglutinable by anticholera O serum, which show that the H or flagellar antigen is non-specific in contrast with the O or somatic antigen. VENKATRAMAN (p. 277) shows that vibrios isolated from natural water in the Madras Presidency, and from the stools of residents of Madura city (which had been free from cholera for a year) were in no case agglutinable by Group 1 (O) serum of Gardner and Venkatraman.

SOPARKAR (p. 277) found *V. cholerae* in the faecal and vomit spots of a large proportion of house flies during the first 8 hours after ingestion, but only occasionally up to 24 hours.

SEAL (p. 278) gives a modification of the Wilson and Blair medium which is an improvement on alkaline peptone water for the isolation of *V. cholerae.* CHATTERJEE (p. 278) shows that in cultures of *V. cholerae* histidine is transformed completely into histamine: changes in

the tissues of cholera patients resemble those produced by histamine. DE ALESSI (p. 278) discusses colony morphology in relation to agglutination of cholera and El Tor vibrios.

MERTENS (p. 279) gives details of the factors which influence the result of the test for haemolysis by vibrios. The test should be strictly standardized.

DE MOOR (p. 279) considers that the recent epidemic in S. Celebes, where the mortality was 65 per cent., was undoubtedly due to the El Tor vibrio. He points out that this vibrio may be more pathogenic than is usually thought and that its relatively weak haemolytic power when freshly isolated may have led previous workers to regard it as true *V. cholerae.* GISPEN (p. 280) also regards the Celebes strain as identical with the El Tor vibrio. In addition to differences in haemolytic power and the results of the Voges-Proskauer reaction he describes the effect of heating to 56°C. for 3 hours, which renders *V. cholerae* inagglutinable by anticholera serum but has no effect on the El Tor vibrio. TAKITA (p. 281) obtained a powerful exotoxin from 5 of 10 strains of the El Tor vibrio, and notes that it differs from the haemolysin.

SOLARINO (p. 281) records experiments in rabbits which prove that the cholera vibrio can pass to the intestine by the blood stream after absorption from the fauces and that it can pass directly through the stomach, resisting the acidity, on into the intestine.

CHATTERJEE (p. 282), finding no evidence of real obstruction to the flow of bile in cholera, considers that the stasis observed may be the result of a nervous action. He suggests that the symptoms of cholera may be due to allergy. The *Calcutta Medical Journal* (p. 282), however, inclines to the view that they are due to specific toxins elaborated in the intestinal wall.

HIGGINS (p. 282) describes the effective emergency hospitals in Shanghai which deal with cholera in refugees. Treatment is essentially a single massive normal saline infusion at the rate of over 2 litres an hour, continued until the pulse is reasonably good and the temperature rise approaches normal. Reactions are common but the mortality is only 7 per cent.

C. W.

TOMB (J. Walker). **A Study on the Epidemiology of Cholera.**—*Jl. Trop. Med. & Hyg.* 1939. Aug. 15. Vol. 42. No. 16. pp. 251–252.

A study of the mortality from cholera in the endemic area of the mining settlement of Asansol situated in the province of Bengal during the years 1918–28 has shown it to be, for the month of March—in non-epidemic years—very constantly one-thirteenth of the total annual mortality. This finding may prove a reliable basis for the calculation of the probable total deaths in any given year.

W. F. Harvey.

PASRICHA (C. L.), LAHIRI (M. N.), DAS (P. C.) & PAUL (B. M.). **The Serological Types of Vibrios isolated from Cholera Patients in Calcutta.**—*Indian Med. Gaz.* 1939. Nov. Vol. 74. No. 11. pp. 680–681.

The authors have studied a large number of vibrios isolated from 959 clinical cases of cholera during 1939. Altogether 438 vibrios were

obtained for examination. Their serological type was determined by means of rabbit sera prepared from dried Inaba and Ogawa O antigens. In the 438 bacterially positive cholera cases 60·7 per cent. of the vibrios were of Inaba O-, 25·8 per cent. Ogawa O-, 2·8 per cent. Inaba HO-agglutinable vibrios and 10·7 per cent. were not agglutinable with any of the three sera. *W. F. H.*

AHUJA (M. L.) & SINGH (Gurkirpal). **Observations on the "H" Antigen of Vibrios.**—*Indian Jl. Med. Res.* 1939. Oct. Vol. 27. No. 2. pp. 287–295.

Cholera H or flagellar antigen is non-specific by contrast with the somatic or O antigen. This fact is also expressed by saying that "there is considerable serological overlapping in respect of the 'H' antigen amongst vibrio strains isolated from cholera and non-cholera sources." In the present study 219 strains of vibrios, non-agglutinated by O serum and comprising 56 strains from cholera cases, 35 strains from healthy persons and 128 strains from water, were investigated in respect of their H antigen chiefly with an HO Inaba cholera serum. Two types of test suspension were used: (1) formolized agar washings with opacity equal to 2,000 million vibrios per cc. and (2) chloroform extracts with opacity of 4,000 million per cc. The latter gave the greater number of positive results namely 42·9, 60 and 56·5 per cent. for case, carrier, and water strains respectively. The result, taken over the whole 219 vibrios, shows that 35·5 per cent. possess H antigen partially or completely identical with that of *V. cholerae*, and this general statement was borne out by the use of cross-absorption tests carried out with pure H sera prepared against 10 strains of varied origin but agglutinable with HO cholera serum. Strains not agglutinated by HO cholera serum formed a heterogeneous group, "some of them showing partial H relationship amongst themselves, but the majority" possessing individual H antigens. *W. F. H.*

MADRAS: REPORT OF THE KING INSTITUTE, GUINDY, FOR THE YEAR ENDING 30TH SEPTEMBER, 1938 [SHORTT (H. E.), Director]. pp. 27–29; 29–31.—**I. Cholera Enquiry** [VENKATRAMAN (K. V.). **II. Cholera (Fly) Transmission Enquiry** [SOPARKAR (M. B.)].

I. The cholera enquiry was directed to the determination of types of vibrio isolated under varying conditions and from varying sources. In certain districts where outbreaks of cholera of ordinary severity had occurred the vibrios, as usual, were of Inaba type, but in other districts, in which there were only sporadic cases of cholera, the vibrios isolated were also of Inaba type, although in previous years they had been of Ogawa type. Was this change associated with low incidence or only accidental? An enquiry is to be made to determine this point.

Vibrios were isolated from natural sources of water. None of these agglutinated with group 1 O serum [presumably this refers to Group 1, Gardner and Venkatraman, of which Inaba is a subtype], while their distribution in HEIBERG's scheme of groups, I, II, III, IV, V, VI and VIa was 113, 139, 2, 2, 17, 10 and 17 respectively. In Madura city which had been free of cholera for the whole year no vibrios agglutinable by group 1 O serum were isolated from the stools of 6,301 residents.

II. Experiments to determine how long the cholera vibrio remains viable in the housefly after ingestion gave only 2 out of 60 positive

results up to 4 hours. It was found, however, " that cholera vibrios could be isolated from the faecal and vomit spots of the fly in a large number of cases during the first eight hours after feed and only occasionally up to 24 hours." *W. F. H.*

SEAL (S. C.). **A Preliminary Note on the Relative Efficiency of Bismuth-Sulphite Medium and Peptone-Water Enrichment in the Isolation of *V. cholerae* from Human and Other Sources.**—*Indian Jl. Med. Res.* 1939. Oct. Vol. 27. No. 2. pp. 297–311.

The original Wilson and Blair broth medium had the composition : Fairchild's peptone 10 ; lab-lemco 5 ; distilled water 1,000, faintly alkaline, with the additions mannite 0·5 per cent., 1 in 5 exsiccated sod. sulphite 6 per cent., and liq. bismuthi 0·2 per cent. The mixture was heated to boiling to produce a flocculation and received a final addition of 1 per cent. brilliant green. This was " standard broth (A) ", to each 100 cc. of which were added 1 cc. absolute alcohol and 4 cc. 1–10,000 mercuric chloride. With this medium, intended to secure growth of *Bact. typhosum*, it was possible to inhibit the growth of *Bact. coli* and to suppress those overgrowing organisms *Proteus* and *Bact. alcaligenes*. Modifications, made to adapt the medium for isolation of *V. cholerae*, were the substitution of peptone for broth, mannose for mannite, the omission of brilliant green and adoption of *p*H 9·2 [this *Bulletin*, 1939, Vol. 36, p. 894]. The present author has made further modifications by which " liq. bismuthi concentration was increased threefold, sod. chloride was replaced by sea-salt mixture and mannose was reduced to half." His findings are :—" In cases of clinical cholera, in which the number of agglutinable vibrios may be expected to be relatively large, the . . . . results show some difference in favour of the new medium " over alkaline peptone water.

W. F. H.

CHATTERJEE (Hemendra Nath). **On the Capacity of Cholera Vibrios to convert Histidine into Histamine.**—*Calcutta Med. Jl.* 1939. Sept. Vol. 36. No. 3. pp. 179–180.

Many bacteria, such as streptococci, staphylococci and typhoid organisms, when grown in a synthetic medium are found to be unable to convert the histidine present into histamine. In cultures of *Bact. coli* most of the histidine is transformed into histamine and in cholera cultures it is completely transformed. Changes in tissues and organs of cholera patients resemble those produced by histamine.

W. F. H.

DE ALESSI (Evasio). Morfologia delle colonie, agglutinazione aspecifica e prove di agglutinazione crociata in alcuni stipiti di *Vibrio cholerae* e di vibrio " El Tor." [**Colony Morphology, Non-specific Agglutination and Crossed Agglutination in Cholera and El Tor Vibrios.**]—*Giorn. di Batteriol. e Immunol.* 1939. Aug. Vol. 23. No. 2. pp. 161–185. With 11 figs. [16 refs.] English summary.

Twenty strains of vibrios have been studied as regards morphology of the colonies resulting from transference to ordinary alkaline laboratory agar. The changes in form induced may have been due primarily to alteration of conditions of nutrition which have brought about spontaneous variation. True cholera strains are more apt to show such variation than the El Tor strains but it has to be remembered that

most of the El Tor strains had been much more recently isolated than the cholera strains. Non-specific agglutination by chemical substances, such as trypaflavine and safranin, is correlated with dissociation phase and colony type, and as such may prove helpful in the separation of strains. There is little doubt that the colony phase—R non-haemolytic and S haemolytic—is highly important for the outcome of the specific agglutination reactions of cholera vibrios, just as it is for Salmonella organisms. The phenomena of dissociation of phase are especially apt to occur in laboratory cholera strains and serological reactions are highly correlated with the morphology of colonies and this latter with antigenic constitution. *W. F. H.*

MERTENS (W. K.). Over verschillende factoren die de resultaten van het onderzoek naar het haemolyseerend vermogen van cholera-vibrionen kunnen beïnvloeden. [**Factors Influencing Haemolysis by the Cholera Vibrio.**]—*Acta Leidensia* (*Scholae Med. Tropicae*). 1939. Vol. 14. pp. 157–175. With 1 chart.

Haemolysis, and more especially its absence, is such an important diagnostic feature of the cholera vibrio that it is very essential that the technique adopted to estimate this potency should be carefully and critically examined. It seems evident that very stringent conditions have to be laid down before the test can be regarded as completely valid. A number of these conditions are examined by the author: (1) *Influence of species of goat.*—Little evidence that either species or individual affected the haemolysis to any appreciable extent is forthcoming. (2) *pH, salt, and blood concentration.*—With a reading after 2 hours, salt concentration of 0·85 per cent., use of 5 per cent. erythrocytes and a variation of *p*H from 4 to 9, safe results may be obtained. It was found, however, that simple uninoculated bouillon (5 cc. bouillon to which has been added 2 drops of defibrinated goat's blood after one washing with normal salt solution) would haemolyse in 8 or 9 days. The point is important in the estimation of late haemolysis. (3) *Washing of erythrocytes.*—Corpuscles of unwashed blood appear to be protected by serum and are more resistant to haemolysis than washed blood. (4) *Temperature.*—Distinct differences in the occurrence of haemolysis were found for temperatures of 26°C. and 37°C. (5) *Anaerobiasis.*—Haemolysis, or its absence, was little affected under anaerobic conditions. (6) *Contact of vibrios and erythrocytes.*—Shaking of vibrios with blood promotes better contact and facilitates haemolysis. (7) *Number of vibrios.*—At room temperature with thick suspensions of 24-hour agar cultures even cholera strains can give haemolysis within 24 hours. It is obvious that this finding might have to be considered in the ordinary testing, with thin suspensions, for true cholera and El Tor vibrios. *W. F. H.*

i. DE MOOR (C. E.). Epidemische cholera in Zuid-Celebes, veroorzaakt door vibrio el tor. [**Epidemic Cholera in South Celebes caused by** *Vibrio El Tor.*]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1939. Sept. 5. Vol. 79. No. 36. pp. 4034–4099. With 1 map.

ii. ——. **Epidemic Cholera in South Celebes caused by** *Vibrio El Tor.*—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1939. Vol. 28. No. 4. pp. 320–355. With 1 map.

i. There was no doubt about the nature of the cholera epidemic which lasted some six months. It was true clinical Asiatic cholera and the

details of 48 cases are recorded here. Doubt arose as to its cholera nature, however, when the causal vibrio was found to be one which caused haemolysis of sheep erythrocytes in nutrient bouillon after 24 hours' incubation. The conjunction of a haemolytic vibrio with true epidemic cholera, having a mortality rate of 65 per cent., was a new event. It could only be an El Tor vibrio, as was shown by its cultural and serological characters, but El Tor vibrios, in spite of their close relationship to cholera vibrios, are practically non-pathogenic. A comprehensive survey is made, in this article, of the whole El Tor question and a very good summary is made of the various contributions to that controversy, which began in 1905 and still continues. This El Tor vibrio belongs to Gardner and Venkatraman's subgroup O 1, to Heiberg's type I, to the Ogawa serological strain and is haemolytic to goat cells. The epidemic caused by it was over in six months and did not occur again. The identity of the organism does not seem to be in doubt, but the author asks whether, considering the weakness of the haemolytic power of the vibrio when freshly isolated, it is not possible that in previous instances El Tor vibrios may have caused epidemics and been simply ranked as true cholera vibrios. [See also this *Bulletin*, 1939, Vol. 36, p. 374.]

ii. This is an English version of the same paper. *W. F. H.*

GISPEN (R.). Les différences entre le vibrion El Tor et le vibrion cholérique. [**Differentiation of the El Tor and Cholera Vibrios.**]—*Ann. Inst. Pasteur.* 1939. Sept. Vol. 63. No. 3. pp. 293–301. [15 refs.]

The specific relationships of cholera, El Tor and Celebes vibrios are considered together. Examination of two of the Celebes (Macassar) strains confirmed that they are identical with the specific El Tor vibrio. El Tor agglutinable vibrios are possessed of an exohaemolysin for goat's blood in bouillon, while cholera vibrios show under the same circumstances only an endohaemolysin [see also this *Bulletin*, 1939, Vol. 36, p. 373]. It has been shown also that both cholera and El Tor vibrios possess the same polysaccharide but cholera possesses protein I and El Tor protein II. An examination of 81 strains of cholera and 31 strains of El Tor for the Voges Proskauer reaction gave 76 cholera strains negative and 23 El Tor positive [see also this *Bulletin*, 1939, Vol. 36, p. 372]. So far it seems that haemolysis of goat's blood in bouillon and the Voges-Proskauer reactions are the only practical means by which the two vibrios can be distinguished. A third testing reaction, the reaction to heat, is described in this work :—Cholera vibrios in saline suspension are rendered inagglutinable by heating at 56°C. for 3 hours, that is to say the suspension is no longer rendered clear by the anticholera serum. An El Tor suspension, on the other hand, is not affected in its agglutinability. Celebes vibrios behave like the El Tor vibrios. A temperature of 60°C. is necessary to destroy the agglutinability of these two latter vibrios. The conclusion is reached that " in general characters and chemical structure the El Tor vibrio occupies a position intermediate between the cholera vibrio and non-agglutinable vibrios " and that the two vibrios, although identical in antigenic structure, do represent different species [see also this *Bulletin*, 1939, Vol. 36, pp. 374–375]. *W. F. H.*

TAKITA (Jungo). **Preparation of Toxin and Antitoxin of El Tor Cholera Vibrio.**—*Kitasato Arch. Experim. Med.* 1939. Sept. Vol. 16. No. 3. pp. 218–236.

Experiments were conducted with 10 strains of El Tor vibrios on the production of toxin and antitoxin. Five strains gave a powerful and specific exotoxin killing laboratory animals rapidly by intravenous injection. This lethal toxin differs from the haemolysin although, with few exceptions, it is produced by haemolytic strains only. The optimum conditions for production of a potent toxin are the adjustment of bouillon culture surface and volume to a ratio 4·7 or 5* and incubation for 2 to 7 days. Intravenous minimum lethal doses, with death in 24 hours, were 0·01 cc. per kilogm. weight in mice and 0·25 cc. in rabbits, while intraperitoneal and subcutaneous doses were 25 times and 50 times greater respectively. Toxoid with antigenic property could be produced from the toxin by the action of 0·05 per cent. formalin or 0·1 per cent. sodium ricinoleate at 37°C. for 24 hours and 1 hour respectively. It was shown that fresh sera of animals will neutralize the toxin, but that this power was lost by heating at 56°C. for 30 minutes, whereas the specific immune serum might be heated for 30 minutes at 60°C. without loss of power. *W. F. H.*

SOLARINO (Giuseppe). Sulla patogenesi del colera. Contributo alla conoscenza dell'evoluzione del colera sperimentale nel coniglio. [**Experimental Cholera in Young Rabbits.**]—*Giorn. di Batteriol. e Immunol.* 1939. July. Vol. 23. No. 1. pp. 1–16. [21 refs.] English summary.

Thirteen rabbits were used, 10 sucklings of 4 to 9 days old, 2 adolescents and 1 adult and the experiments were designed to test (1) the possibility of passage of vibrios by the lymphatic and blood stream to the intestine, and (2) their ability to pass the barrier of the acid stomach into the intestine. In the former series of experiments the cholera vibrios were deposited from 24-hour cultures on the buccopharyngeal mucosa after division of the oesophagus and ligature of the two ends, thus precluding direct entry into the stomach. In the second series of experiments a gastrotomy was carried out and vibrios introduced directly into the stomach, by which the pharyngeal-lymphatic-blood circulation route was excluded. The results of these experiments have shown that the contention of SANARELLI for passage of vibrios by absorption from mouth and pharynx and transmission to the intestine without traversing the stomach is confirmed. Perhaps it is more interesting, in the second set of experiments, to have evidence that—contrary to general opinion—vibrios can resist the acidity of the stomach and pass thence into the intestine. The conclusion from these experimental studies would seem to be that vibrios can pass to the intestine by the blood stream after absorption from the fauces and also that they can pass directly through the stomach on into the intestine [see also this *Bulletin*, 1939, Vol. 36, p. 898]. *W. F. H.*

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* *Sic.* The directions are :—"A flask having a diameter at the bottom of 10 cm., an inclination of the wall of 30 or 40 degrees and a capacity of 270 cc. was used ; in this, 15 cc. of the bouillon was placed." This makes the ratio of the surface area in sq. cm. to the volume in cc. about 5 : 1.

CHATTERJEE (Hemendra Nath). **A Further Contribution to the Study of Cholera.**—*Calcutta Med. Jl.* 1939. Sept. Vol. 6. No. 3. pp. 165–178. With 3 figs. on 2 plates. [82 refs.]

CALCUTTA MEDICAL JOURNAL. 1939. Sept. Vol. 36. No. 3. pp. 213–214.—**Pathology of Cholera.**

The condition of the gastro-intestinal tract and the haemolymph glands has already been dealt with [see this *Bulletin*, 1939, Vol. 36, p. 902]. That in other organs consists mainly in dilatation of the capillaries. Distension of the gall bladder and bile stasis occur with more or less total absence of bile from the intestine, but there is little microscopic change to be found in the gall bladder and biliary tract, nor is there evidence of any real obstruction to bile flow. These facts suggest that the hindrance to the exit of bile is due to a nervous mechanism. Shock, which is the chief feature of cholera, does not altogether resemble the shock due to other causes. It is probable that cholera shock does not depend on dehydration alone but is also due to great dilation of capillaries in the various organs. The patient bleeds into his own capillaries. In his discussion the author assembles evidence to suggest that the symptom complex of cholera is not toxaemic or an acute inflammatory manifestation but rather an allergic state. In the editorial which follows the article it is stated that the collapse of cholera "appears to be mainly due to reduction in the absolute volume of blood owing to loss of fluid by evacuations" and to capillary engorgement in the visceral areas. "At the present stage of our knowledge cholera cannot be regarded as an allergic manifestation as it is difficult to imagine specific hypersensitiveness in epidemic diseases. The chemical theory is much more attractive . . . The symptoms of cholera have been sought to be explained by the production of histamine in the intestinal canal" [this *Bulletin*, 1939, Vol. 36, p. 901]. All things considered, however, it seems probable that the effects of the cholera vibrio are due to specific toxins "elaborated in the intestinal wall." *W. F. H.*

HIGGINS (A. R.). **Cholera in Shanghai War Refugees.**—*U.S. Nav. Med. Bull.* 1939. Apr. Vol. 37. No. 2. pp. 287–289.

With the incursion into Shanghai of war refugees, who were ill-nourished and dirty, it is not surprising that cholera soon became a major hospital problem. The account here given of primitive but seemingly efficient treatment is exceedingly interesting. "A typical cholera hospital . . . is a converted dwelling house into which 150 beds have been crowded." The clinical diagnosis of cholera is made on the presence of painless purging, dehydration, rice-water stools, and aphonia. On admission, a matter of 5–10 per cent. only of the total cholera applicants, the patient proceeds immediately to the saline infusion room, is placed on a string cot, through the meshes of which he continues to defaecate into cresol solution contained in a shallow 6 ft. × 4 ft. galvanized pan. Vomit is received into the cuspidor. An autoclaved normal salt solution made with good table salt and singly distilled water is administered intravenously from a cylinder at 6 feet above arm level. The treatment is essentially one of a single massive saline infusion. Urgency and pressure on accommodation necessitate rapid administration of the saline infusion which is usually in excess of 2,000 cc. per hour "continued until the pulse, commonly imperceptible on admission, is reasonably good and the temperature

rise approaches normal." Reactions are common, as might be expected from the mode of preparation of the solution and rapidity of the transfusion. These receive little attention. Clinical improvement is dramatic with attainment of a good pulse, and relapses are few. The death rate in this particular hospital has been no more than 7 per cent. Convalescent management is merely rest with continued forcing of fluids by the mouth and little or no medication. There are no orderlies and no nurses and the patient is attended to by family or friends. When the patient can take rice water he is discharged. "The management of this extremely active hospital with rapid turnover of almost moribund patients and on an infinitesimal budget furnishes an interesting lesson" to those accustomed to the expense of any ordinary hospital. *W. F. H.*

MALARIA.

Précis of Abstracts in this Section.

The Malaria Advisory Board of the F.M.S. (p. 284) reports increased prevalence during 1937, possibly due to extensive replanting of rubber which offers facilities for the breeding of Anopheles. Bispham (p. 284) estimates that over 1,600,000 persons are infected in eight southern States in U.S.A. although only 100,000 are reported annually, and emphasizes the importance of the problem.

Raffaele (p. 285) describes the process of the formation of male gametes from microgametocytes. Jerace (p. 285) discusses an unusual form of parasite observed in man.

Zviagintzev (p. 286) found by experiment that as the salinity of water increases the number of egg-layings by *A. m. sacharovi* decreases, but that *A. m. maculipennis* shows no particular preference up to a concentration of 1·5 per cent. Increasing concentrations of NaCl are unfavourable to the viability of the eggs. Joyeux *et al.* (p. 286) name the anophelines of the French Sudan. Wallace (p. 287) discusses the effect of the proximity of cattle on the resting places of *A. maculatus* in Malaya. He (p. 287) has proved that *A. maculatus* can fly 1⅜ miles in search of food.

André and Toumanoff (p. 287) describe the anopheline population of a hill resort near Hanoi. Toumanoff (p. 288) shows that female *A. hyrcanus* var. *sinensis* raised in the laboratory in summer and winter respectively have a length of life varying inversely with their fecundity.

Boyd and Earle (p. 288) found that *A. quadrimaculatus* is much more susceptible than *A. pseudopunctipennis* to strains of *P. falciparum*.

Farinaud and Prost (p. 289) contrast the healthy Moïs and the unhealthy Annamites, both living on the intensely malarious plateaux of S. Indo-China and ascribe the difference to the more solid immunity developed by the adult Moïs [in the protocols, however, the spleen rates appear to indicate a much heavier infection in childhood in the Moïs although the living conditions are described as similar].

Shute (p. 289) noted protracted incubation periods, averaging 282 days, in patients infected with *P. vivax* by mosquitoes. This delay may be due to restricted numbers of healthy sporozoites, but is also seen if a large dose of atebrin is given immediately after the infective bite. Nikolajev (p. 290) records extensive observations on the duration and course of malaria infection. Livadas *et al.* (p. 291)

describe the condition of the blood in 113 patients with malaria. ROY (p. 291) describes an unusual case.

MARILL *et al.* (p. 291) have obtained, in malarial splenomegaly, good results with intravenous injections of quinine, quinacrine and praequine in successive courses each of 5 days in one week, the whole being repeated 3 times. DIKSHIT (p. 292) discusses the concentration of atebrin in the blood and tissues. He (p. 292) shows that when given in normal doses neither atebrin nor plasmoquine passes through the placenta.

GENEVRAY *et al.* (p. 293) record successful drug prophylaxis with premaline administered once each week to a community in Tonking, but for permanent improvement anti-mosquito measures are essential.

NICHOLAS (p. 293) describes a simple automatic sluice. MURRAY (p. 294) recounts the findings in his work on the spreading power of larvicide oils. JURCHAK and BOZHENKO (p. 295) use a suspension of Paris green in water, with naphtha or petroleum, and find it more effective and cheaper than dust mixtures. LA FACE (p. 295) reports that *A. m. typicus* and *A. m. labranchiae* are still found in an area of bonification in Italy. *C. W.*

FEDERATED MALAY STATES. ANNUAL REPORT OF THE MALARIA ADVISORY BOARD FOR THE YEAR 1938 [KINGSBURY (A. Neave), Chairman].—22 pp. With 4 charts. 1939. Kuala Lumpur. Govt. Press. [$1 or 2*s.* 4*d.*]

The numbers of admissions to government and estate hospitals obviously give but an imperfect idea of malaria incidence. As far as they go they indicate a greatly increased incidence of malaria during 1937: the number of cases treated was 51,300 as compared with 35,500 in 1937 and 27,200 in 1936. In all four States the incidence curve reached its height in May. Extensive replanting of rubber, offering as it does increased facilities for Anopheles breeding, is believed to have been an important factor in determining increased malaria prevalence. Nine cases of blackwater fever were reported as compared with seven in the previous year. The case mortality rate, for the F.M.S. as a whole, fell from 2·2 to 1·8 per cent.

Reference is made to observations on the value of prontosil as a remedy for malaria [see this *Bulletin*, 1939, Vol. 36, p. 399]. Further experiments were carried out as to the relative efficiency of various anti-larval oils. It was found that the addition of pyrethrum to the more active larvicidal oils that are recommended resulted in larvae dying more rapidly, but the number that eventually died was not increased: the addition does not serve any useful purpose. Experiments with calves showed that anti-malarial oil is not harmful to cattle.

In one area fascine drainage, for which rubber tree branches were used, is still functioning well after six years.

Other matters of interest referred to in the Report have been published in the literature and duly noted in this *Bulletin*.

Norman White.

BISPHAM (W. N.). **Malaria in the Southern States.**—*Southern Med. Jl.* 1939. Aug. Vol. 32. No. 8. pp. 848–851.

Malaria in eight Southern States is a notifiable disease but notification is very incomplete. In one county where special efforts were made to

get physicians to report cases the number so reported rose from 351 to 1,414 ; in another county, from 38 in 1936 to 212 in 1937. In the last few years 30,000 school-children have been examined in the southern States ; the parasite index ranged from 4 to 9. Among Civilian Conservation Corps enrollees there was a parasite index of 9. On the basis of these observations it is probable that the number of infected persons in the area is no less than 1,600,000. Only some one hundred thousand cases are reported annually. The examination of school-children showed that *P. falciparum* infections varied from zero to 80 per cent., average 35. *P. malariae* is very rarely found.

The elimination of malaria from this area is a stupendous task. Past efforts at prevention have been abortive. The need for systematic work based on the results of complete malaria surveys is stressed. The problem of prevention of malaria in the Southern States is important. *N. W.*

RAFFAELE (G.). Sulla struttura dei gameti maschili dei plasmodidi. [**Structure of Male Gametes of Plasmodium.**]—*Riv. di Malariologia.* Sez. I. 1939. Vol. 18. No. 3. pp. 141–152. With 3 figs. & 1 coloured plate. [12 refs.] English summary.

In the formation of male gametes from the microgametocytes of malarial parasites the author finds that the first thing to happen is the extrusion of a gamete-producing body which contains most of the chromatin. Finally this body may separate from a residual mass in which most of the pigment and some chromatin remains. The residual body may make some abortive attempt to produce gametes but if any are produced they are not capable of fertilization. The gametes proper are formed by the gamete-producing mass of cytoplasm which extrudes at first a cytoplasmic filament or flagellum to which becomes attached the actual fertilizing process containing the chromatin. The mature male gamete consists of a chromatin-containing tapering filament, to the anterior end of which is attached a long flagellum, which is generally more or less adherent to the filament throughout its length. In structure, therefore, the male gametes resemble closely the male gametes of coccidia as first described by SCHAUDINN for *Eimeria schubergi.* *C. M. Wenyon.*

JERACE (Felice). Raro reperto ematico e parassitario nella malaria umana. [**Unusual Blood Picture and Stage of Parasite in Human Malaria.**]—*Riv. di Malariologia.* Sez. I. 1939. Vol. 18. No. 3. pp. 153–158. With 1 coloured plate. [13 refs.] English summary (5 lines).

In a blood film from a case of malaria the author found a mixed infection of *Plasmodium falciparum* and *P. malariae.* The various abnormalities in the red and white corpuscles are enumerated, while what appears to the author to be a non-pigmented schizont in a normoblast is described and figured in a coloured plate. He discusses this parasite in relation to the erythrocytic schizonts seen so commonly in bird malaria and certain forms described as non-pigmented schizonts in human malaria by RAFFAELE [see this *Bulletin*, 1938, Vol. 35, p. 514] and TARSITANO and LUCREZI, but it appears to the reviewer that these forms from man are too indefinite to be compared with the very characteristic and distinct reproducing forms from birds. *C. M. W.*

MAYNE (Bruce). **Graphic Reproduction of the Life Cycle of the Malaria Parasite in the Mosquito Host.**—*Nat. Inst. Health Bull. No. 170.* Washington (continuation of *Hyg. Lab. Bull.* Series). 1938. June. 15 pp. With 27 plates (3 coloured).

This is a clear and full, yet concise, account of the life cycle of the malaria parasite. The admirable microphotographs contribute much to its value. It will be invaluable to the student. *N. W.*

ZVIAGINTZEV (S. N.). Contribution au problème de la faculté séléctive des femelles anophèles lorg de la ponte et le sort des oeufs pondus dans des collections d'eau de salinité diverse. [**Selective Faculty of Female Anopheles for Waters of Varying Salinity for Egg-Laying, and the Fate of Eggs laid therein.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1939. Vol. 8. No. 2. [In Russian pp. 181–189. With 2 figs. French summary p. 189.]

Earthenware vessels were inserted up to their rims in the floor of an insectarium measuring 6 by 3 by 3 metres, and were filled with NaCl solutions of various dilutions and with fresh water as a control. Large numbers of *A. maculipennis maculipennis* and *A. m. sacharovi* females were kept in the insectarium in as natural conditions as possible. In a preliminary experiment nine dilutions of NaCl from 0·25 to 3 per cent. and fresh water were used. This experiment showed that factors other than the salinity of the water also influenced the choice of water for egg laying, such as the proximity of the vessel to the walls and corners of the insectarium, and the distance of the vessel from the sheltering place. In the crucial experiment the position of the vessels was changed each day. In this experiment dilutions of from 0·25 to 1·75 per cent. were used.

The number of egg-layings by *A. m. sacharovi* decreased with the increase of the salinity of the water from 0 to 1·75 per cent. *A. m. maculipennis* showed no great preference either for fresh water or salt water up to a concentration of 1·5 per cent. In the concentration of 1·75 per cent., however, the number of layings was much less. Some eggs were laid by both species in all concentrations, even up to 3 per cent.

Increasing concentrations of NaCl exercise an unfavourable influence on the viability of the eggs. Eggs which hatch out in concentrations of from 2 to 3 per cent. produce larvae which perish before reaching the second stage. *N. W.*

JOYEUX (Ch.), SICÉ (A.) & SAUTET (J.). Note préliminaire sur l'anophélisme au Soudan français. [**Anophelism in the French Sudan, Preliminary Note.**]—*Bull. Soc. Path. Exot.* 1939. June 14. Vol. 32. No. 6. pp. 616–617.

Collections of anophelines were made in all parts of the French Sudan during the rainy seasons, July to October, of 1937 and 1938. The following species were found: *A. gambiae, A. funestus, A. coustani, A. nili, A. pharoensis, A. rufipes,* and *A. squamosus. A. gambiae* and *A. funestus* were found throughout the territory, the former enormously predominating. The other species were almost confined to areas irrigated from the Niger, and where malaria is particularly severe: *A. gambiae, A. pharoensis* and *A. coustani* were all numerous in these areas. The geographical distribution of the species, the nature of their breeding places and their relation to malaria will be considered in a future report. *N. W.*

DUREN (A.). Clef des anophèles du Congo belge. [**Key to the Anopheles of the Belgian Congo.**]—*Ann. Soc. Belge de Méd. Trop.* 1939. June 30. Vol. 19. No. 2. pp. 161–191. With 12 figs.

WALLACE (R. B.). **Resting Places of Anophelines on an Inland Hilly Estate.**—*Jl. Malaya Branch Brit. Med. Assoc.* 1939. June. Vol. 3. No. 1. pp. 33–40. With 4 charts.

In an inland hilly estate in Malaya at the begining of May 1938 there was a human population of about 3,250 and 554 cattle. Routine catching of Anopheles has been carried out once a week for 12 years past in the coolie lines and in the cattle sheds of all six divisions of this estate. In May 1938 all cattle were removed from the estate. The effect this had on the catches of Anopheles during the four subsequent months is illustrated by charts, on which the monthly catches of the different species are compared with the catches of the corresponding months of the previous year. The majority of *A. maculatus* were always caught in coolie lines: small numbers only were caught in cattle-sheds. After the removal of the cattle there was a slight increase in the coolie line catches, but this increase may have been due to other causes. In Java this species is much more attracted by cattle than it is in this part of Malaya. *A. karwari* prefers cattle-sheds, as do *A. philippinensis*, *A. hyrcanus*, *A. kochi* and *A. vagus*. *A. aconitus* was caught only in small numbers. *A. hyrcanus* practically disappeared after the removal of the cattle, though this species has been described by other authors as markedly anthropophilic. *N. W.*

WALLACE (R. B.). **The Range of Flight of** *Anopheles maculatus*.—*Jl. Malaya Branch Brit. Med. Assoc.* 1939. June. Vol. 3. No. 1. pp. 22–32. With 1 chart & 3 figs.

Anti-larval measures confined to the half-mile, and even the three-quarter-mile, radius frequently fail to prevent seasonal waves of malaria in areas where *A. maculatus* breeding is intense. This was the chief reason that prompted the experiments described. Three areas were chosen for experiment, the most suitable being rubber land surrounded on three sides by high hills of virgin jungle; the fourth side is open and contains the coolie lines. There are no human habitations between the lines and the jungle, the intervening space being planted with mature rubber. Mosquitoes were collected for about a week. These were sprayed with painter's gold dust and then liberated at various distances from the coolie lines. Thereafter for several nights two trained catchers collected adult mosquitoes in the coolie lines. The results of eight such experiments are tabulated. Only a small proportion of the liberated *A. maculatus* was recaptured but it was proved that mosquitoes can fly a distance of one and three-eighths miles in search of food. *N. W.*

ANDRÉ (M.) & TOUMANOFF (C.). Etude sur le paludisme et la faune anophélienne dans le centre d'estivage du Mont-Bavi. [**Study of Malaria and Anopheline Fauna in the Hill Station of Mount Bavi.**]—*Rev. Méd. Française d'Extrême-Orient.* 1939. Apr. Vol. 17. No. 4. pp. 415–428. With 1 fig. & 1 plan.

This paper describes the creation of a military hot-weather resort on a spur of mount Bavi, not far from Hanoi. Its altitude is 600 metres.

There were numerous cases of malaria during the first season, 1937. Most if not all of these were relapses and during the last two summers malaria has been much less in evidence. It is doubtful whether malaria has been acquired locally. When the station was installed but two anophelines could be found there, *A. aitkeni* and *A. maculatus*. Since then other anophelines have made their appearance, *A. hyrcanus* var. *sinensis* and var. *nigerrimus*, *A. fuliginosus*, *A. maculipalpis*, *A. tesselatus*, *A. aconitus* and *A. jeyporiensis*. These species have hitherto only been found in the adult stage in horse stables; their larvae have not been found. This increase in the anopheline fauna, due apparently to the growing traffic, indicates the necessity of limiting possible breeding places to a strict minimum and the treatment of gamete carriers before they are sent to the hill station. *N. W.*

TOUMANOFF (C.). Observations sur la fécondité et la longévité de *A. hyrcanus* var. *sinensis* Wied. [**Fecundity and Longevity of** *A. hyrcanus* **var.** *sinensis*.]—*Bull. Soc. Path. Exot.* 1939. July 12. Vol. 32. No. 7. pp. 726–730. With 1 fig.

Females of *A. hyrcanus* var. *sinensis* in Tonking in summer can lay 6 or 7 batches of eggs, totalling, in two cases observed, 881 and 607 eggs, respectively. In winter most females only laid a single batch of eggs and that after a long period of functional debility during which repeated blood meals were taken. At the end of winter one female laid four batches of eggs but the total number of eggs laid was only 305. Females in winter live longer than they do in summer. In summer the length of life was from 5 to 8 weeks during which time numerous batches of eggs were laid. In winter semi-debilitated females have been kept alive as long as 18 weeks. Female mosquitoes raised in the laboratory in summer and winter respectively thus have a length of life varying inversely with their fecundity. *N. W.*

CHANG (T. L.). **Mosquitoes of Hunan Province with Special Reference to Anopheles.**—*Chinese Med. Jl.* 1939. July. Vol. 56. No. 1. pp. 52–62. [19 refs.]

BOYD (Mark F.) & EARLE (Walter C.). **On the Susceptibility of a Neotropical** *Anopheles pseudopunctipennis*, **Theobald, 1901, to Nearctic and Neotropical Strains of** *Plasmodium falciparum*.—*Amer. Jl. Trop. Med.* 1939. July. Vol. 19. No. 4. pp. 405–408.

A report by Boyd, CARR & ROZEBOOM on the relative susceptibility of nearctic and neotropical anophelines to strains of malaria from the same regions has already appeared [see this *Bulletin*, 1938, Vol. 35, pp. 659–660]. In this further extension of that work the authors compare *A. pseudopunctipennis* from highlands in the State of Morelos, Mexico, with a Florida strain of *A. quadrimaculatus*, with regard to the susceptibility to strains of *P. falciparum* from the same regions. Their observations show that *A. pseudopunctipennis* is much inferior to *A. quadrimaculatus* in its susceptibility to either strain; that even in its own habitat it is probably a very inefficient vector of *P. falciparum* and that *A. quadrimaculatus* is more susceptible to the Mexican strain than to the Floridan strain of *P. falciparum*. Some proportion of all the lots of *A. quadrimaculatus* became infected on every application to either strain; only one lot of *A. pseudopunctipennis* in each series developed infection and then only in a low degree. *N. W.*

HINMAN (E. Harold). **Recent Advances in Entomological Knowledge of Malaria Control. Report of the Subcommittee on Entomology.**—*Southern Med. Jl.* 1939. Aug. Vol. 32. No. 8. pp. 857–862. [43 refs.]

FARINAUD (E.) & PROST (P.). Recherches sur les modalités de l'impaludation en milieu Moï et en milieu Annamite. [**Malaria Infections in Populations of Annamites and Moïs Contrasted.**]—*Bull. Soc. Path. Exot.* 1939. July 12. Vol. 32. No. 7. pp. 762–769. With 3 figs.

In the intensely malarious high plateaux of south Indo-China one is struck by the contrast in the appearance of the often athletic-looking Moïs, and the sickly Annamite population of more or less recent importation. The difference is ascribed to the more solid immunity to malaria developed by the adult Moïs population. The results of the inquiry which was destined to throw light on the causes of this marked difference in the reaction of the two races to malaria are best summarized by reproducing two tables from the report :—

Moïs : 1,000 *children and* 1,219 *adults examined.*

	Age						
	0–6 months	6–12 months	1–2 years	2–5	5–10	10–15	Adults
Spleen index ...	73·3	93·2	98·1	96·6	84·0	63·2	18·5
Parasite index ...	71·6	96·6	96·3	92·8	75·9	60·1	26·6
Gamete index ...	20·0	40·6	41·6	33·5	18·8	15·9	5·3

Annamites living under similar conditions: 712 *children and* 344 *adults.*

Spleen index ...	57·0	31·4	53·8	62·8	59·0	61·0
Parasite index ...	38·1	41·6	37·8	35·7	41·4	18·6

Among the Moïs population all infants are infected. The infant mortality rate is high, 30 per cent. All three forms of Plasmodia are present : in adults only *P. falciparum* is found, splenomegaly decreases as age advances. The high percentage of gamete carriers among young children is noteworthy.

Among the Annamites the splenic index increases throughout childhood and is high among adults. The adult Annamite remains an invalid : the Moïs become tolerant of their infections. *N. W.*

SHUTE (P. G.). **Protracted Incubation Periods in Indigenous Cases of Malaria in England.**—*Jl. Trop. Med. & Hyg.* 1939. July 15. Vol. 42. No. 14. pp. 201–204. With 1 chart.

Two cases of naturally acquired *P. vivax* malaria in England with protracted incubation periods are reported.

The author directs attention to the interesting fact that the interval between the initial attack and the first late relapse in naturally induced *P. vivax* malaria approximates closely the length of protracted incubation periods. The study of which the results are recorded concerns a Rumanian strain of *P. vivax*. Of 145 patients infected by mosquitoes,

52 relapsed. Of these one relapsed two months after the primary inoculation, one after three months, and the remainder between six months and one year, the average interval being 263 days. Of the nine cases of protracted incubation periods observed with the same strain the average length of that period was 282 days. It was further noted that if a large dose of atebrin be given immediately after the infective bite of the mosquito the febrile attack will commonly not develop till six to nine months later; such cases behave as cases with protracted incubation periods. Of 19 such cases, 10 per cent. developed the attack between the second and seventh months; 85 per cent. between the eighth and twelfth months, and 5 per cent. during the thirteenth month. The average interval was 263 days. These patients were infected at all seasons of the year.

The author considers it possible that latent infections are due to the inoculation of restricted numbers of healthy sporozoites. The Rumanian strain produced fewer gametocytes than a tropical strain and the mosquitoes infected had fewer oöcysts. The number of sporozoites injected would be fewer than in the case of the tropical strain. Latency was more often observed with the Rumanian than with the tropical strain. *N. W.*

NIKOLAJEV (B. P.). Sur la durée et la marche de l'infection paludique chez l'homme. [**The Duration and Course of Malaria Infection in Man.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1939. Vol. 8. No. 2. [In Russian pp. 191–204. With 1 chart. [17 refs.] French summary pp. 204–206.]

This paper records the results of seven years' observations in Leningrad on 11,347 cases of naturally acquired malaria and 200 cases of experimental benign tertian malaria transmitted by mosquitoes. The patients were in conditions which precluded the possibility of repeated infection. The naturally acquired infections were all recent the probable dates of infection being ascertainable with sufficient accuracy: *P. vivax* infections numbered 9,464, of which 5,220 had protracted incubation periods; *P. falciparum* 719; *P. malariae* 310, and mixed infections 854. Of the 200 cases of induced malaria 43 had protracted incubation periods, from 254 to 360 days.

The duration of malaria infections is limited; the longest duration of *P. vivax* infections, from the time of infection, is 27 months, and of *P. falciparum* infections 20 months. There is no reason to believe that either of these parasites can survive in the human host for indefinite periods. The number of *P. malariae* cases was more limited; certain infections with this species persisted from three to four years.

Each species of parasite is characterized by its own period of primary manifestations and its own periodicity of relapses. If *P. vivax* infections have short incubation periods relapses often occur during the first two or three months following infection. Thereafter in a number of cases infection remains latent, with small tendency to relapse, for four or five months. From the 8th to the 13th month after infection relapses are frequent and persistent. Relapses are most frequent from the 8th to the 10th month. After this relapses become invariably less frequent and two years after infection convalescence is complete in the majority of cases. In *P. vivax* infections with prolonged incubation periods the four to six months following the first clinical manifestations of the disease are the period in which relapses are most intense, that is

from the 10th to the 15th month after infection; after this relapses invariably become less frequent.

In *P. falciparum* infections relapses occur regularly during the four to six months following infection; thereafter there is a marked decline in the number of relapses. There is a gradual diminution in the severity of each successive relapse.

In *P. malariae* infections relapses occur during the eight to ten months following infection; most are experienced during the first six months. Thereafter relapses become slowly, but constantly, less frequent. During the first year relapses occur at relatively short intervals; afterwards they occur at intervals from 12 to 16 months.

Experience with induced malaria shows that prevalent ideas regarding the influence of season on the course of malaria infections have no foundation. *N. W.*

LIVADAS (G.), CANELLAKIS (A.) & VALAORAS (V. G.). **Some Observations on the Haematological Picture in Malaria.**—*Riv. di Malariologia.* Sez. I. 1939. Vol. 18. No. 3. pp. 159–165.

The observations recorded concern 113 patients suffering from malaria in the village of Vovoda, situated on a hill some 500 metres above the sea, near the north coast of the Peloponnese. All the patients had fever and parasites in the blood; the blood examinations were made before the commencement of treatment. Malaria is endemic in Vovoda, but when the observations were made transmission was unusually low; most of the cases were probably relapses. The species of Plasmodium found were *vivax* 82, *falciparum* 20, *malariae* 9 and mixed 2. Qualitative alteration of red cells was rarely observed. Red cells numbered less than 3½ million in just over a quarter of the cases, and between 3½ and 4½ million in just over a half. In three-quarters of the cases haemoglobin varied between 60 and 80 per cent.; only 13 per cent. had a lower haemoglobin content. The number of platelets was diminished in almost all cases. Most cases showed a leucopenia; leucocytosis was observed in a few cases during the access. The leucocytic type was lymphocytosis, or lymphocytosis combined with monocytosis. Neutrophilia was not observed. Haemoglobin was most diminished in *malariae* infections; leucopenia was most marked in *falciparum* infections. *N. W.*

ROY (Sudhir Chandra). **An Unusual Case of Subtertian Malaria.**—*Indian Med. Gaz.* 1939. Aug. Vol. 74. No. 8. pp. 478–479.

A case of subtertian malaria the onset of which was accompanied by aphasia: the temperature rose to 105·8°F. on the first day. On the following day there was paralysis of the right leg and paresis of the right arm. On the third day there was severe haemorrhage from the bowels. Quinine was administered; the patient recovered.

N. W.

MARILL (F.), GUILY (P.) & KESSIS (R.). Chimiothérapie intraveineuse au cours du paludisme chronique. (Note préliminaire.) [**Intravenous Chemotherapy of Chronic Malaria.**]—*Bull. Soc. Path. Exot.* 1939. June 14. Vol. 32. No. 6. pp. 600–602.

Many cases of excessive splenomegaly presumably caused by malaria, in many of which it is impossible to find the malaria parasite, are more

or less refractory to anti-malarial medication by mouth. The authors have systematically treated all such patients by intravenous medication. Their type treatment is as follows. First week, five injections, on successive days, each of 1 gm of bihydrochloride of quinine; second week, five daily injections each of 0·30 gm. of quinacrine; third week, five daily injections each of 0·03 gm. of praequine. This procedure is repeated thrice, nine weeks' treatment in all. Out of 120 patients 55 completed the full nine weeks' course; the remainder left before it was completed. The results of the treatment will be given in a subsequent communication; it is stated that they have been superior to results obtained by oral or intramuscular medication. In all 739 intravenous injections of quinine, 1,023 of quinacrine, and 727 of praequine have been given without any serious incident. The quinine is diluted in 100 cc. of glucose serum and injected slowly, the injection taking about 20 minutes. The quinacrine is dissolved in 10 cc. of distilled water and injected slowly from a syringe, in 2 to 3 minutes. Praequine is administered in the same manner as is quinacrine but the injection may be slightly more rapid. *N. W.*

BOMBAY: REPORT OF THE HAFFKINE INSTITUTE FOR THE YEAR 1938 [SOKHEY (S. S.), Director].—**Concentration of Atebrin in the Blood and Tissues** [DIKSHIT]. p. 47.

Atebrin diffuses very rapidly into the tissues; concentration is greatest in the spleen, liver and lungs. After oral administration the concentration is highest in the liver; after intravenous injection the lungs contain as high a concentration. After oral or parenteral administration, of varying doses, the concentration of atebrin in the blood rapidly reaches a level of about 1/300,000 and remains at that level for some time. If atebrin be continuously infused into the vein of an experimental animal the heart continues beating till a concentration of about 1/90,000 in the coronary circulation is reached. *N. W.*

BOMBAY: REPORT OF THE HAFFKINE INSTITUTE FOR THE YEAR 1938 [SOKHEY (S. S.), Director].—**Effect of Plasmoquine and Atebrin on the Foetus** [DIKSHIT]. p. 46.

Experiments to demonstrate the filtration of plasmoquine by the placenta were made by recording the movements of the foetal diaphragm. The respiratory centre of the foetus is very sensitive to the action of plasmoquine when very small quantities of the drug are introduced directly into the foetus. When the drug is introduced into the maternal circulation no action on the foetal respiration could be observed. Similar experiments were made with atebrin which, in therapeutic doses, was also filtered out by the placenta. When doses of atebrin far in excess of therapeutic doses were given to the mother evidence of the appearance of the drug in the foetal circulation was obtained. *N. W.*

LIPSCOMB (F. M.). **Experience with Synthetic Drugs in the Treatment of Malaria.**—*Proc. Roy. Soc. Med.* 1939. July. Vol. 32. No. 9. pp. 1082–1086 (United Services Sect. pp. 24–28).

SIVALINGAM (V.). **Malarial Fevers and their Treatment.**—*Jl. Ceylon Branch Brit. Med. Assoc.* 1939. May. Vol. 36. No. 3. pp. 157–180. With 6 charts.

THOMAS (René). Introduction et culture des quinquinas au Congo belge et spécialement au Kivu. Création d'une plantation de cinchona Ledgeriana. [**Cultivation of Cinchona in the Belgian Congo.**]—*Bruxelles-Méd.* 1939. Aug. 20 & 27. Vol. 19. Nos. 42 & 43. pp. 1300–1307; 1332–1339. With 7 figs.

GENEVRAY (J.), TOUMANOFF (C.) & TRY (H. T.). Essai de prophylaxie du paludisme par la prémaline dans une localité du Tonkin et son effet sur le degré d'infection naturelle du vecteur majeur (*A. minimus* Theob.). [**Malaria Prophylaxis with Premaline in Tonking and its Effect on the Natural Infection of the Chief Vector,** *A. minimus.*]—*Rev. Méd. Française d'Extrême-Orient.* 1939. Apr. Vol. 17. No. 4. pp. 397–414. With 1 fig. [37 refs.]

This experiment in premaline prophylaxis was carried out in a coffee plantation in the province of Ninh-Binh, the malaria problems of which have been described by the authors in a previous publication [see this *Bulletin*, 1939, Vol. 36, pp. 131–132]. The coolies and their families numbering 71 individuals in all are housed in 6 groups of houses. These houses harbour very numerous *A. minimus*, the chief vector. No other antimalaria measures have been undertaken. The incidence of malaria was very high. There are no stables in the near vicinity of the houses. Persons living in a near-by village acted as controls. Before the experiment began the spleen, parasite and gamete indices of children in the treated group were 85·7, 71·4 and 28·5, and of adults 51·5, 39·4 and 9·0 per cent., respectively. Premaline was the only drug used. A tablet of premaline contains quinacrine 0·10 gm., praequine and rhodoquine, of each, 0·005 gm. The dose for adults and children above 12 was 3 tablets; for infants below the age of one it was half a tablet. For six months these doses were given once a week: during the succeeding six months they were given every 10 days. The results are described in detail. The weekly administration reduced the spleen rates of children and adults to 25 and 21; the parasite rate of children was brought rapidly to, and maintained at, zero. No case of malaria occurred during these six months and the general health was markedly improved. The administration of the drug at ten-day intervals was insufficient; in less than a month cases of malaria began to occur. The drug was well tolerated.

The administration of premaline did diminish the infection rate of mosquitoes but at the end of the experiment the infection rate of *A. minimus* was 2·58 per cent., which indicates severe endemicity. For any permanent improvement antimosquito measures and prophylactic medication will be necessary. *N. W.*

NICHOLAS (W. A.). **A Four-Day Automatic Sluice.**—*Jl. Malaya Branch Brit. Med. Assoc.* 1939. June. Vol. 3. No. 1. pp. 44–46. With 1 plan.

This is a clear description of a simple and effective automatic sluice that is easy and inexpensive to construct. A reservoir 40 feet long, 5 feet wide and 4 feet deep is separated by a 9-inch concrete wall from a small reservoir, 28 × 14 × 40 inches. A half-inch pipe traverses the wall and connects the two reservoirs; an adjustable cock on this half-inch pipe regulates the rate at which the small reservoir is filled. A six-inch inverted U syphon leads from the large reservoir to the outfall; the small reservoir is provided with a half-inch inverted

U syphon. A half-inch pipe connects the U-bends of the two syphons. When the small reservoir is sufficiently full to overcome the air seal in the small syphon the water syphons off and in so doing unlocks the air-seal in the U-bend of the large syphon and the sluice comes into operation. The effective length of sluicing for a reservoir of the size described is about 600 yards of a water-course 4 feet wide. *N. W.*

BLACKLOCK (D. B.). **Notes on Siphon Action, with Special Reference to Anti-Mosquito Work.**—*Ann. Trop. Med. & Parasit.* 1939. July 20. Vol. 33. No. 2. pp. 141–160. With 8 figs.

This paper discusses the functions of siphons, their applicability to mosquito control, and their possibilities. Laboratory experiments, with very simple apparatus, are described which furnish useful information as to the manner in which the difficulties experienced in obtaining efficient automatic siphonage may be overcome. The paper can be consulted with advantage by all those who are interested in this means of mosquito control. *N. W.*

MURRAY (David R. P.). **Problems concerning the Efficiency of Oils as Mosquito Larvicides.—II. The Spreading Power of Oils and Methods of increasing it.**—*Bull. Entom. Res.* 1939. July. Vol. 30. Pt. 2. pp. 211–236. [12 refs.]

"1. A method is described of using the Adam-Langmuir surface pressure trough for the direct measurement of the spreading power of oils against surface contamination.

"2. Pure higher paraffins are non-spreading and pure aromatics have only a small spreading pressure. Commercial grades of oils owe what spreading pressure they have to impurities which are only present in small quantities and can be removed.

"3. The spreading power of oil is greatly increased by irradiation of very thin layers of the oil. Even so, only a small fraction undergoes chemical change, the great bulk being recoverable with its original properties.

"4. Straight chain fatty acids and alcohols only raise the spreading pressure of clean oil to a figure which is often already reached in a cruder product. There is some evidence however that a simple group such as —OH can produce a high pressure if attached to the right hydrocarbon framework. Of the substances investigated the ones producing the greatest effect were the products of combined polymerisation and oxidation of olefinic hydrocarbons (cracked spirit gum) and the products of sulphonation of oils.

"5. Substances soluble in water do not form good spread-aiders because they dissolve out of the oil which then contracts again if there is resistance to its spread.

"6. The maximum spreading pressure exerted by a substance in oil solution is greater in paraffin than in aromatic oils.

"7. When oil is shaken with a solvent which separates aromatics from paraffins, the spreading constituents, whether naturally occurring or added, pass into the aromatic fraction. Strong concentrates can be obtained in this way, and methods can be easily devised for transferring the active materials from one oil to another.

"8. The spreading constituents can be entirely removed from oil by filtering it through fullers' earth."

[See also this *Bulletin*, 1938, Vol. 35, p. 654.]

JURCHAK (F. F.) & BOZHENKO (V. P.). Utilisation des suspensions de poisons pulvérulents dans la lutte antilarvaire. [**Use of Suspensions of Poisonous Powders as an Anti-Larval Measure.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1939. Vol. 8. No. 2. [In Russian pp. 170–176. French summary p. 176.]

Suspensions of Paris green are more effective, cheaper and more convenient than dust mixtures. In simple aqueous suspension Paris green, 1·5 to 2 kgm. per hectare, kills all larvae of mosquitoes in open reservoirs. Its use is five times cheaper than oiling. Either petroleum or naphtha, 1 to 2 kgm. per hectare, increases the floatability of the Paris green, though in these doses these substances exercise no direct lethal effect on larvae. The authors recommend Paris green 0·6 kgm., naphtha or petroleum 1 to 2 kgm., suspended in water, per hectare of surface to be treated. *N. W.*

LA FACE (Lidia). Sull'anofelismo della bonifica di Maccarese. [**Anopheline Prevalence in the Maccarese Reclamation.**]—*Rendiconti Istituto di Sanità Pubblica.* Rome. 1939. Vol. 2. Pt. 1. pp. 213–220. With 5 figs. (4 on 2 plates).

Much has been written of the wonderful achievement of the Maccarese "bonification." The author reports that two races of *A. maculipennis* still persist in that region, *typicus* and *labranchiae*. The latter is most prevalent in that part of the region in which agricultural improvements have been less developed. The importance of further studies into the conditions of rice cultivation in the areas in which *A. m. labranchiae* is particularly abundant is stressed.

N. W.

WILLIAMS (L. L.), Jr. **Malaria Prevention Activities, 1938.**—*Southern Med. Jl.* 1939. Aug. Vol. 32. No. 8. pp. 851–853.

This is a summary in general terms of the progress effected during the year in malaria prevention activities in the southern States. The majority of the State health departments in the malaria belt now have malaria control units. *N. W.*

BOLETIN SANITARIO. Buenos Aires. 1939. Jan. Vol. 3. No. 1. pp. 891–915. With 16 figs. & 1 plate.—Metodos de lucha antipaludica en la Republica Argentina. Informe presentado a la X Conferencia Sanitaria Panamericana por el Presidente del D. N. de H., Dr. Miguel SUSSINI [ALVARADO (C. A.)]. Apendice. Metodos especiales de lucha antipaludica el "Subterraneo Biologico" [VILLAGRÁN (Rafael)]. [**Anti-Malarial Measures in the Argentine.**]

HELMINTHIASIS.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

Ascaris infection.—AUGUSTINE (p. 297) quotes experiments which indicate that the Ascaris of monkeys is a strain distinct from that of man and that *Macaca mulatta* is not susceptible to infection with

human and porcine Ascaris. MASSIAS and NGUYÊN-DINH-HAO (p. 298) attribute to Ascaris a case of intussusception, and BOLOGNA (p. 298) discusses Ascaris infection in relation to surgery.

Enterobius infection.—BRADY and WRIGHT (p. 299) give a detailed account of the symptoms found in 200 cases. Restlessness and insomnia may occur but enuresis and nervous irritability were not especially common. CRAM and NOLAN (p. 300) report 55 per cent. of the children in a modern private nursery school in Washington to be infected and detail the control measures subsequently adopted.

MINDLIN and URRIBARRI (p. 300) advocate enemata containing ether in the treatment of Enterobius infections.

Filarial infections.—OHAMA (p. 300) discusses the prevalence of *W. bancrofti* infections in children in two Japanese primary schools.

BASU and RAO (p. 301) show that the physical conditions in which microfilariae best reach infectivity in mosquitoes lie between 70° and 90°F., and between 70 and 100 per cent. relative humidity. Highest infection and infectivity was found when the infecting bloods contained between 101 and 150 microfilariae in 0·2 cc., and when the age of the patients was 51–60. A criticism of the statistical methods used is appended.

DASSANAYAKE (p. 302) shows how the disappearance of *Pistia stratiotes* from a large tank and from a swamp, in Ceylon, has been followed by a great diminution in or disappearance of infection by *Mf. malayi*. On the other hand HODGKIN (p. 302) shows that in Malay, various other species of Mansonia do not (as in the case of *M. annulifera*) prefer to attach themselves to *Pistia stratiotes* but, as for example the most important, *M. longipalpis*, prefer the roots of swamp trees or other water plants. Removal of Pistia is therefore not enough in control of *Mf. malayi* infection and the only available measure appears to be drainage, which is discussed. BONNE-WEPSTER (p. 303) records species of Mansonia from Borneo. With BRUG (p. 303) he also shows that *M. uniformis* uses a considerable number of water plants as hosts for eggs, larvae or pupae.

PRAWIROHARDJO (p. 304) discusses the efficiency of the vectors of *Mf. bancrofti* in Batavia and gives a list of mosquitoes grouped as to their ability to transmit this infection, based on his own experimental work.

KNOTT (p. 304) shows that microfilariae may be found in the day blood of any person in whom they are present in the night blood, provided that a sufficient quantity is examined, and describes his method of laking and sedimenting by gravity the quantity of blood advised, namely 1 cc. Laking is best carried out with 2 per cent. formalin and the sediment may be stained with methylene blue and eosin. Details are given. From a series of examinations of a single patient infected with *Mf. malayi*, GALLIARD and NGUYEN HUU PHIEM (p. 305) observe that maximum and minimum numbers were found on different occasions at different hours and that the total numbers over the 24 hours were quite variable.

HAWKING (p. 306) has discovered onchocerciasis in the Kakamega district of Kenya, with microfilaria in the skin of 62 per cent. of 53 persons with eye lesions or with nodules on the head or neck, and in 38 per cent. of 53 unselected persons. Nodules were present in 16 per cent. of microfilaria-positive persons.

DUBOIS and VITALE (p. 306) report on a focus of *Mf. streptocerca* infection in the Congo, and describe the embryo. Although embryos

are found frequently in the skin in association with elephantiasis this may be a result of lymph stasis rather than a cause of that condition.

Gnathostoma infection.—MAPLESTONE and SUNDAR RAO (p. 307) report the finding of a second gnathostome in a patient from whom 10 years ago the first was removed. They incline to the opinion that no reinfection had occurred and that this second worm had survived the whole period of 17 years since the history commenced. DAENGSVANG (p. 307) reports a tumour of the omentum, in the centre of which was a female gnathostome.

Trichinella infection.—SAWITZ (p. 308) has found 24 cases of human trichiniasis in 400 unselected autopsies in the United States. If the diaphragm alone is examined 13 per cent. may be missed, and he has in addition examined pectoral muscles to obviate this. No history of clinical symptoms was recorded. In cats 10 per cent. were infected and the incidence in cats is taken as an indication of endemicity. TANG (p. 308) records the infection rate in rats in Fukien. FAILMEZGER and SPALDING (p. 308) found larvae in the venous blood of 3 children in one family. Symptoms were typical and commenced simultaneously ; eosinophilia was marked.

EVERS (p. 309) reports a case of trichiniasis with symptoms of toxic encephalitis and neuroretinitis and larvae in the cerebrospinal fluid.

MCNAUGHT *et al.* (p. 309) found that sulphanilamide and (especially) phenothiazine reduced the severity of Trichinella infection in rats by a considerable proportion. OTTO and ABRAMS (p. 309) confirm that 55°C. is the lowest temperature which will destroy Trichinella larvae. The *Journal of the American Medical Association* (p. 309) discusses trichiniasis in Germany.

Trichuris infection.—DINNIK (p. 310) gives the points on which he differentiates *T. trichiura* from *T. suis.* DINNIK and DINNIK (p. 310) note the variations in the time of development of Trichuris eggs.

C. W.

AUGUSTINE (Donald L.). **Observations on Some Ascarids from a Chimpanzee** (*Pan troglodytes*) **with Experimental Studies on the Susceptibility of Monkeys** (*Macaca mulatta*) **to Infection with the Human and the Pig** *Ascaris.—Amer. Jl. Hyg.* 1939. July. Vol. 30. No. 1. Sect. D. pp. 29–33. [10 refs.]

The chimpanzee, 9 years old, had been in captivity since it was six months old and died of bronchopneumonia. In the small intestine were 3 male and 3 female mature ascarids in which no morphological difference from *A. lumbricoides* was detected, although these forms were rather smaller, the males 11 to 11·5 cm. long and the females 11 to 13·5 cm.

As to the experiments, the eggs were taken from the uteri of the worms, those from man were freshly voided, those from the pig removed after its slaughter and while the worms were still living. The eggs were incubated at room temperature in a little distilled water and their viability proved by allowing guineapigs to ingest them. Two of the monkeys so fed were given an adequate diet and then Ascaris eggs from man. In one of them faecal examination by smears and " flotation methods " made every other day for two months and weekly for eight months showed no eggs and no immature worms. The second chimpanzee began to cough four days after the infective

meal, this continuing for two weeks, and death from pulmonary tuberculosis followed on day 45; during life no larvae were obtained from throat or nose and no eggs were found in the faeces; after death there were no adults in the intestine, the care taken in this examination being evident from the report that 18 female Strongyloides were recovered from scrapings of the mucosa. A third monkey fed on these infective eggs from man had for three weeks been on a diet deficient in vitamin A; it showed no ill effects from the infective meal but a month later evidence of tuberculous cervical lymph nodes appeared; it died on day 69 and no ascarids or other helminths were present in the bowel. A fourth monkey on adequate diet and fed on 3,000 eggs from the pig Ascaris showed no ill effects and passed no Ascaris eggs during the 8 months of observation. Monkeys are not susceptible to this infection, the experiments indicate that the monkey Ascaris is a strain distinct from that of man. *Clayton Lane.*

MASSIAS (Ch.) & NGUYÊN-DINH-HAO. Poly-invagination intestinale par ascaridiose. Hyperazotémie à 6 grs. 45. [**Intussusception due to Ascaris.**]—*Rev. Méd. Française d'Extrême-Orient.* 1939. May. Vol. 17. No. 5. pp. 615–616.

A youth came into hospital subcomatose with a history of having vomited and passed bloody stools. He had no fever, and no abdominal abnormality was discovered, but *P. vivax* was present in the blood. He died 4 days after admission having had bilious vomiting and passed a blackish stool. In the faeces were eggs of Ascaris, Trichuris and hookworms. At autopsy there were four separate invaginations of the small intestine, about 10 cm. apart, and in two of them was an Ascaris which left its impress on the mucosa. The blood urea was raised to 0·645 gm. per 100 cc. *C. L.*

BOLOGNA (Mario). Osservazioni clinico-chirurgiche sull'ascaridosi. [**Ascaris Infection and Surgery.**]—*Riforma Med.* 1939. July 22. Vol. 55. No. 29. pp. 1099–106, 1109.

In two instances during herniotomy an Ascaris was felt within the intestinal loop. In one it was reduced, colic followed the operation and a glycerine enema effected the expulsion of a knot of worms; in the second it could not be reduced and was extracted through a nick in the intestinal wall, the patient dying and autopsy being refused. In two others simulating peritonitis there were worm knots, in one 42 ascarids were passed after operation, in the other operation was followed by death and the finding of a knot of worms in the ileo-caecal junction at autopsy. In a patient operated on for peritonitis an Ascaris lay in the peritoneum near a small hole in the bowel; in two more a worm lay in the appendix. The work of others on various aspects of the subject is noted. *C. L.*

ROMAN (E.). Biologie d'*Ascaris lumbricoides* jeune; infestation pulmonaire de rongeurs; réinfestation de l'homme parasité. [**Biology of Young** *A. lumbricoides*; **Lung Infection of Rodents; Reinfection of Man.**]—*C. R. Soc. Biol.* 1939. Vol. 130. No. 12. pp. 1168–1170.

"It is thus proved that a man who harbours an adult Ascaris can be reinfected from eggs of the same species which thus accomplish at least a considerable part of their parasitic cycle."

This conclusion, which is unexpectedly looked on as new, is based on the passage by a man after tetrachlorethylene of an adult female *A. lumbricoides* and in addition two small ones measuring 21 and 22 mm. long. The author claims to be the first to show that field mice infected by being fed on embryonated Ascaris eggs show pulmonary symptoms.

C. L.

VARLAKOV (M. N.). Matériaux pour l'investigation de l'effet exercé par certains anthelminthiques sur les lombrics et les ascarides du porc *in vitro*. [**The Effect of Certain Anthelmintics on the Ascarids of Pigs** *in vitro*.]—*Med. Parasit. & Parasitic Dis.* Moscow. 1939. Vol. 8. No. 2. [In Russian pp. 229–234. French summary p. 234.]

BRADY (Frederick J.) & WRIGHT (Willard H.). **Studies on Oxyuriasis. XVIII. The Symptomatology of Oxyuriasis as based on Physical Examinations and Case Histories on 200 Patients.**—*Amer. Jl. Med. Sci.* 1939. Sept. Vol. 198. No. 3. pp. 367–372. [12 refs.]

"Two hundred cases of oxyuriasis were studied with a view of ascertaining the symptomatology of this condition. In each case a history was taken, a physical examination was made, a stool sample was examined for helminth ova, anal swabs were made, and in girls, a vulvar swab was made. The opinion is expressed that symptoms may be caused by mechanical stimulation and irritation by the parasite, by allergic reactions, and by the transportation of organisms to places where they may become pathogenic.

"Many infested children showed gains in weight, improvement in color, and disappearance of dark circles under the eyes after treatment.

"There was an average eosinophil percentage of 5·1 per cent. in 144 pinworm cases compared to 3·7 per cent. in 21 children coming from households in which all individuals were free from pinworms. There is too much deviation from the mean for these figures to assume statistical significance, but it is likely that there is a slight increase in eosinophil percentage in oxyuriasis.

"One case presented symptoms of nausea and vomiting that could not be attributed to causes other than the pinworm infestation. These symptoms disappeared when the pinworm infestation was eradicated. We found no proof that abdominal pain and oxyuriasis were directly related. Only 1 case of the 200 had had an appendectomy. The appetite in many cases was much improved after treatment.

"It is believed that pinworms cause conscious sensation when moving on the rectal and anal mucosa, but that no sensation is felt in the majority of cases after the pinworm has migrated onto the skin. Allergic reactions to pinworm products are probably associated with the very marked sensation experienced by some few individuals from skin migrations.

"Enuresis was not found to be more common in infested patients than in non-infested controls. Evidence is presented that a pinworm vaginitis may be much more frequent than it has been considered to be in the past.

"Restlessness and insomnia are symptoms occurring in pinworm cases. Restlessness in school may lead to scholastic difficulties. The feeling of shame that an impressionable child may have from the knowledge that he or she has pinworms may have repercussions in the behaviorism of the child. Evidence to show that pinworms cause nervous irritability was inconclusive."

CRAM (Eloise B.) & NOLAN (M. O.). **Studies on Oxyuriasis. XIX. Examinations of Children in a Private Nursery School over an 18-Month Period.**—*Public Health Rep.* 1939. Apr. 7. Vol. 54. No. 14. pp. 567–574. With 1 fig. [21 refs.]

In a modern well-equipped private nursery day school for well-to-do white children in Washington examinations for threadworms were made by the NIH swab. Of 106 children originally present 55 per cent. were infected and of 974 swabs used on them 13 per cent. were positive. Of 25 new scholars 8 per cent. were positive. The results of examinations varied considerably from month to month, but after control measures had been instituted the incidence fell, and in the last five months no new infection had been detected.

The control measures consisted of a series of non-medicated enemas, the cleaning of the water closets and washbasins with lysol, which was also sprinkled on floors before sweeping; the sunning of the cots and blankets the children used during the rest period; each child had its own towel, and hand washing after defaecation and before feeding was seen to. *C. L.*

MINDLIN (S.) & URRIBARRI (A.). Tratamiento de la oxyuriasis por enemas de éter. [**Treatment of Enterobius Infection by Ether Enemata.**]—*Prensa Méd. Argentina.* 1939. Aug. 16. Vol. 26. No. 33. pp. 1603–1608.

The enema is to be used as the sole treatment. It is given as 20 grams of ethyl ether in 100 grams of liquid vaselin C.S.P., the dose being one or two soupspoonfuls according to age mixed with an equal quantity of olive oil, pure or mixed with milk, to prevent proctitis and given every 8 or 12 hours for a week, with a week's respite and another week's use. In an alternative enema are added 2 per cent. each of essence of allium sativum and allium cepa while the basis is cod liver oil and sweet almond oil. Two cases are described. *C. L.*

FOLAN (John P.). **The Preparation and Cleaning of the NIH Anal Swab used in the Diagnosis of Oxyuriasis.**—*Public Health Rep.* 1939. July 28. Vol. 54. No. 30. pp. 1392–1395. With 3 figs.

OHAMA (Sinken). **Investigation on the Incidences of *Wuchereria bancrofti* among Primary School Children in Yaeyama, Okinawa Prefecture.**—*Taiwan Igakkai Zassi* (*Jl. Med. Assoc. Formosa*). 1939. Nov. Vol. 38. No. 11. [In Japanese pp. 1625–1631. English summary p. 1632.]

"Examination of peripheral blood obtained at night has been carried out on 113 children of Kabira and 238 children of Taketomi primary schools in order to investigate the incidence of Wuchereria bancrofti amongst them. The results are summarized as follows:—

"1. The average rate of infestation for Kabira and Taketomi primary schools was 20·35 per cent. and 11·76 per cent. respectively, the average rate for the total number of 351 children being 14·81 per cent.

"2. Rate of infection of filariae when observed according to sex shows the following results: Male children, Kabira, 18·18 per cent.; Taketomi, 10·57 per cent.; female children, Kabira, 24·14 per cent., Taketomi, 12·17 per cent., the average rate being 13·48 per cent. for male and 16·18 per cent. for female children.

"3. When the incidence of the children of these two primary schools is observed according to degree, the majority of cases are very light (51·92 per cent.), followed by light (44·23 per cent.), moderate cases being only few (3·58 per cent.). Again when the degree of infection is observed according to sex, in the males the numbers of cases in order are: light (58·33 per cent.), very light (37·50 per cent.) and moderate, while in the female they are very light (64·29 per cent.), light (32·14 per cent.) and moderate.

"4. When the incidence of the children of the two primary schools is observed according to age, the degree of infection is gradually seen to increase with advancing age."

Basu (B. C.) & Rao (S. Sundar). **Studies on Filariasis Transmission.**—*Indian Jl. Med. Res.* 1939. July. Vol. 27. No. 1. pp. 233–249. With 4 graphs.

Nearly ten thousand *Culex fatigans*, which had fed on blood containing microfilariae, were studied and the results are tabulated to show the degrees of infection and of infectivity disclosed when the insects had lived at varying temperatures and humidities, when there was varied density of infection in those on whom the insects fed, and when the age and "race" of the donors differed.

There are unexplained discrepancies between the different tables; for example the numbers of mosquitoes that survived for examination were 3,395 or 4,394. But it seems clear that the physical conditions in which larvae best reach infectivity lie between 70° and 90°F. and 70 to 100 per cent. of relative humidity, indeed at 80°F. and 90 per cent. of humidity all mosquitoes became infective. When these same total figures were so arranged as to consider the microfilarial blood count and that alone, they showed the highest infection and infectivity when the numbers of larvae in 0·2 cc. of blood were between 101 and 150 (the respective percentages being 42·3 and 17·1) and the lowest when these numbers were between 301 and 600 (the respective percentages being 1·4 and 0). When figures were analysed according to the ages of those on whom the mosquitoes fed, the percentage of infectivity of 4,394 insects surviving after being fed on patients between 11 and 40 years old lay between 9·1 and 10; in 89 aged between 41 and 50 it was 28; in 73 aged between 51 and 60 it was 63. As to race, or, as one table puts it "caste," the number of mosquitoes surviving after feeding on Hindus was 2,677 with an infectivity percentage of 9·1; the corresponding figures for Mohammedans were 1,423 and 12·7; those for Indian Christians were 294 and 21·4. This table, then, classifies the figures rather by religion than by race or caste.

[Three tables analyse the numbers of microfilariae found in 3,395 mosquitoes when they are classified firstly according to the temperature, secondly according to the atmospheric humidity at which they were kept, and thirdly by the numbers of microfilariae on which the insects fed. In each analysis the factor under consideration shows a marked influence; but the real influence of each will be made evident only when the figures (which presumably refer to the same mosquitoes) have been so arranged that the other two factors do not vary; and to republish them so tabulated would give its full value to a massive piece of detailed work. The opportunity could then be taken to indicate the interplay between these results and those obtained from the examination of 4,394 mosquitoes analysed in two more tables according to the age and "caste" of the donor.] *C. L.*

DASSANAYAKE (W. L. P.). **Filarial Infection in Relation to Physiographic Changes in Two Localities in Ceylon.**—*Jl. Trop. Med. & Hyg.* 1939. May 15. Vol. 42. No. 10. pp. 145–149.

History, observation and reasoning lead to the conclusion that Malayan filariasis was formerly common in two areas in Ceylon and that changes in physiographic conditions, by getting rid of *Pistia stratiotes*, have eliminated the filarial infection.

Batalagoda tank is an artificial collection of water held up by a dam which is believed to date back to about 100 B.C. Constant breaches brought into being below it a great swamp and in that swamp Pistia flourished. For that statement the justification is that, thanks to the educational work of the Department of Medical and Sanitary Services most people can now recognize the plant. Restoration of the dam was begun by Parker in 1900, and has been completed for a number of years and associated with the work was Madahapola Dissawa, now a retired chief headman, who remembers the tank before its renovation and when covered with Pistia plants. At that time THORNHILL reported there many cases of elephantiasis of the legs but could find none of other parts, and of 15 persons without symptoms he discovered nocturnal filaria in five. In 1937, Dassanayake made a night blood survey and found no microfilariae, those examined including 104 from villages named by Thornhill, and his investigation disclosed only 2 cases of elephantiasis, one from each of two of these villages.

Again MANSON-BAHR (1914) found in a certain village a number of cases of filariasis and a microfilaria rate of 22 per cent. In that village Dassanayake found a microfilaria rate of 0·6 per cent. (1 of 162 persons examined) and two cases of elephantiasis. What had happened in the meantime was an encroachment of paddy fields into the swamp under stress of growing population, the appearance of the water hyacinth, the intervention of the Agricultural Department bringing about the drainage of the swamp, and the practical disappearance of Pistia.

C. L.

HODGKIN (E. P.). **The Transmission of *Microfilaria malayi* in Malaya.** —*Jl. Malaya Branch Brit. Med. Assoc.* 1939. June. Vol. 3. No. 1. pp. 8–11.

The larvae and pupae of *Mansonia* species " force their specially modified spiracles into the air-containing tissues of water plants " ; as to these " each species of *Mansonia* has its preferences and therein lies the value of the study of the biology of these insects and the possibility of applying species sanitation to their control."

" *Mansonia annulifera* appears to prefer to attach itself to the roots of *Pistia stratiotes*, a very common water plant particularly in Chinese fish ponds. *M. uniformis* on the other hand prefers the water hyacinth (*Eichornia crassipes*) but also breeds prolifically where there are other plants, particularly a certain swamp grass (*Isachne australis*). In what way *M. indiana* differs in its preferences from *M. uniformis* it is difficult to say, but the adults of the two species have not been found to be common together. The larvae of *M. annulatus* have not yet been found, but from the distribution of this species it is safe to assume that it breeds in jungle though not necessarily only there. The fifth and most important species, *M. longipalpis*, is to be found attached to the fine roots of certain swamp loving trees. These roots emerge from the soil and float about in the water, which in such places is often as much as three feet deep. Whether the larvae of this species will be found in other places remains to be seen ;

its haunts are not such as to encourage much careful conservation, since not only does it bite by day in the jungle but, as can well be imagined, leeches abound in such places and are lavish in their attentions. It is, however, safe to say that it only exceptionally breeds with the three species whose breeding places are known."

"In South India, where *M. annulifera* is the vector of *Mf. malayi*, it has proved possible to stop the transmission of the disease simply by removing by hand all the *Pistia stratiotes* which is essential for the development of *M. annulifera*. Such a delightfully simple method of preventing the transmission of the disease seems to be out of the question where *M. longipalpis* is the vector, and at present I can see no alternative to extensive drainage."

"It may be some time before drainage can have much effect on the areas where the disease is already endemic, but when new areas are being opened their proximity to actual or potential breeding places of *M. longipalpis* should be borne in mind. The danger of providing breeding places for *M. longipalpis* by blocking the drainage must also not be forgotten . . . . Although it may be impossible to effect a startling reduction in the transmission of the disease, by applying our knowledge of the biology of the vectors the incidence of filariasis can be reduced and the formation of new endemic areas avoided."

[It is clear that, as was wrongly supposed by the reviewer (this *Bulletin*, 1939, Vol. 36, p. 150) it is not merely Pistia which is in question in the prevention there of Malayan filariasis since, as is now disclosed, the main local vector is held to be *M. longipalpis* and its young forms do not, the evidence is, prefer Pistia.] *C. L.*

BONNE-WEPSTER (J.). **Notes on Mosquitoes from the Netherlands Indies. Two New** *Mansonia* **Larvae from Borneo.**—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1939. Vol. 28. No. 1. pp. 11–13. With 2 plates. [Reviewed in *Rev. Applied Entom.* Ser. B. 1939. Sept. Vol. 27. Pt. 9. p. 187.]

"In August 1937, the author received from the interior of Borneo 3 females of *Mansonia annulata*, Leic., and 4 of *M. longipalpis*, Wulp, from a Dyak village in which the population was infected with *Filaria* (*Microfilaria*) *malayi*. A few weeks later, he received another 12 females, all taken on man, comprising 2 of *M. longipalpis*, 6 of *M. indiana*, Edw., and 4 of *M. crassipes*, Wulp. Several larvae were subsequently collected there in a small lake near the roots of a common vegetable, *Ipomoea* sp.; the lake was usually covered with *Eichhornia crassipes*, but the larvae were not observed near the roots of this plant. A series of *M. longipalpis* and *M. crassipes* were bred from larvae in test tubes, with *Ipomoea* as the host plant; the larvae of these species are described."

BONNE-WEPSTER (J.) & BRUG (S. L.). **Observations on the Breeding Habits of the Subgenus** *Mansonioides* **(Genus** *Mansonia*, **Culicidae).** —*Tijdschr. Ent.* Amsterdam. 1939. Vol. 82. Pt. 1–2. pp. 81–90. [18 refs.] [Summarized in *Rev. Applied Entom.* Ser. B. 1939. Sept. Vol. 27. Pt. 9. p. 187.]

"The following is based on the authors' summary of observations on the breeding habits of mosquitos of the subgenus *Mansonioides* of *Mansonia* carried out in Batavia and in a swamp of the Serajoe Delta, Java: The larvae and pupae are often difficult to detect, and a search for the eggs is sometimes more successful. Eggs, larvae and pupae may

be found on water plants other than *Pistia*, even in breeding places well stocked with this weed. *Mansonia* (*Mansonioides*) *uniformis*, Theo., used a considerable number of water plants, lists of which are given, as hosts either for its eggs or for its larvae and pupae. If only *Pistia* is present, the majority of the larvae sometimes occur not on its roots, but in the water or mud at the bottom. Some evidence was obtained that oviposition and hatching in *M.* (*M.*) *annulifera*, Theo., occur periodically."

PRAWIROHARDJO (Soewadji). Infectieproeven met microfilaria bancrofti bij verschillende muskietensoorten in Batavia. [**Tests of Infectivity of** *Mf. bancrofti* **for Mosquitoes in Batavia.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1939. July 4. Vol. 79. No. 27. pp. 1691–1705. With 1 plate. English summary.

"The importance of *C. fatigans* as intermediate host of *Filaria bancrofti* differs in various parts of the Dutch East Indies as demonstrated by BRUG. There are indications of similar differences in adaptability to act as carrying agents of filariasis bancrofti among other mosquito species. To supply additional data concerning this phenomenon, mosquitoes were allowed to feed on the same bancrofti-patient in Batavia and dissected after varying intervals. These mosquitoes were partly wild, partly laboratory bred; the wild ones were captured after entering the mosquito-curtain during the night under natural conditions, the laboratory bred mosquitoes were let loose in the curtain during the evening. The possible fallacies of the method are discussed. Much attention was given to the completeness and the rapidity of filarial development and to phenomenon of chitinization in the dissected specimens.

"The author comes to the following conclusions:

"Good vectors for filariasis bancrofti in Batavia: *Culex fatigans*; *Anopheles ludlowi*; *Anopheles subpictus*.

"Probably good vectors in Batavia: *Anopheles fuliginosus*; *Anopheles vagus*; *Anopheles barbirostris typicus* and *Anopheles tesselatus*.

"Probably of little importance as vectors in Batavia: *Culex sitiens*; *Culex whitmorei*; and *Culex fuscocephalus*.

"Of no importance as vectors in Batavia: *Culex tritaeniorhynchus*; *Culex vishnui*; *Culex gelidus*; *Culex bitaeniorhynchus*; *Aëdes albopictus*; *Aëdes aegypti*; *Armigeres obturbans*; *Mansonia annulifera* and probably also *Mansonia indiana*."

KNOTT (James). **A Method for making Microfilarial Surveys on Day Blood.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1939. July 28. Vol. 33. No. 2. pp. 191–196.

"Any case showing microfilariae in the night blood will show microfilariae in the day blood also if sufficient of it is searched."

It is far easier to make a survey on day than on night blood, and this paper considers means by which a large quantity of blood may be taken by day, laked, and made available for rapid examination.

The quantity of blood used is 1 cc. If this is laked in hypotonic sodium citrate solution, the gravity precipitate is fluffy and cannot satisfactorily be spread or stained; if laked in dilute formalin solution, the gravity sediment is compact, and spreads and stains readily. The method is as follows. In a 15 cc. conical centrifuge tube are placed 10 cc. of a 2 per cent. solution of the standard aqueous formalin (which contains 40 per cent. of gaseous formaldehyde). To this is added 1 cc. of blood taken by syringe through a fine needle from a vein (quicker and less painful than lancing the finger) and the whole is thoroughly mixed by shaking and tilting. The tube is set aside for 12 to 24 hours,

decanted by a quick tipping which carries away fluid and bubbles but does not disturb the sediment. The latter is removed by a long capillary pipette containing a little clean water and fitted with rubber tube and mouthpiece, the contents discharged on to a slide, mixed and spread over 2 by 3 cm. as a thin film, and dried flat. For staining, these are the instructions :—

"The dry spread is stained for 2 or more minutes with Loeffler's methylene blue (saturated solution of methylene blue in alcohol, 30 c.c.; aqueous 1 in 10,000 solution of potassium hydroxide, 100 c.c.), then rinsed free of excess stain and dried; it is next counterstained for 1 or 2 minutes with 0·5 per cent. aqueous solution of eosin, rinsed, and dried. The eosin removes the methylene blue from the leucocytes and stains them a purplish red. The microfilariae retain the methylene blue, the nuclei and cytoplasm staining, but not the sheath; but if left on too long, the eosin will decolourize the parasites as well as the leucocytes. Giemsa stain shows up with the structure of the microfilaria, the nuclei staining sharply and the sheath being beautifully evident; but it must be used on sediment spreads, or thin blood films, where there is little stained fibrin in the background; though double staining with haematoxylin and eosin is very good on blood spreads, the formalin sediment does not stain well with haematoxylin.

"Sediment spreads are good for close study of the structure of the microfilaria because of the attitudes they take up. Thus when a drop of water or oil is spread over the stained area and the slide examined with the 16 mm. (⅔ inch) objective and the 5 power ocular, without a cover slip, the background is made up of the purplish-red leucocytes which are as thick as red corpuscles in an ordinary thin blood spread; the microfilariae are found stretched out into half or quarter circles; they readily strike the eye by the colour contrast and the linear breaks in the background of the field."

The use of this method for the making of a survey, in regions where filariasis is periodic, is described in detail. This survey comprised 155 lads between 16 and 22.

". . . . of the 66 positives 20 or 30·3 per cent. were shown by the 20 c.mm. day drop; 54 or 81·8 per cent. by the 20 c.mm. night drop; 57 or 86·8 per cent. by the 1 c.c. day sediment, and 62 or 94 per cent. by the 1 c.c. night sediment, while four more were found by the 10 c.c. night sediment."

C. L.

GALLIARD (H.) & NGUYEN HUU PHIEM. Sur la périodicité dans la filariose à propos d'un cas d'infestation par *Filaria malayi*. [**Periodicity in a Case of Infection with** *F. malayi*.]—*Ann. Parasit. Humaine et Comparée.* 1939. May 1. Vol. 17. No. 3. pp. 193–198. With 2 charts.

From a man whose work when not in hospital necessitated irregular hours of sleep, the authors on four different occasions made two-hourly examinations of finger blood, each series covering 24 hours. The organism in question was *Mf. malayi*. They point out that the maximal and minimal numbers were found on different occasions at different hours, and that the total numbers over the 24 hours were quite variable. Even when in hospital the aortic regurgitation from which he suffered prevented his sleeping properly at night. They hold that in spite of all that has been said on the subject of periodicity we have advanced little and must be content to observe facts. [Nor should it be taken for granted that the periodicity of appearance of *Mf. malayi* is applicable to that of *Mf. bancrofti*.] *C. L.*

RIVOALEN (A.). La filariose en Extrême-Orient. [**Filariasis in the Far East.**]—*Rev. Méd. Française d'Extrême-Orient.* 1939. Mar. No. 3. pp. 260–264. With 2 figs.

HAWKING (Frank). **A New Focus of Onchocerciasis occurring in Kenya Colony.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1939. June 29. Vol. 33. No. 1. pp. 95–106. With 1 map & 3 figs.

" Onchocerciasis has remained unnoticed at Kakamega for many years until a chance discovery led to its presence being suspected, a suspicion which is now confirmed Probably a search for it in other parts of East Africa will reveal its occurrence in many places in which it has not yet been recognized "

The chance discovery actually lay in Hawking's noticing that in two instances Europeans with blinding filariasis had served at one time in the Kakamega district, the eye trouble having begun some three years later. He accordingly investigated a number of skin shavings, 1 to 2 sq. cm. in area (taken from inhabitants of these parts) soaked in normal saline for 15 to 60 minutes, the fluid being centrifuged after the skin had been picked out of it, and the precipitate dried, fixed and stained on a slide. The shavings were taken from the scapular region or from the surface of a nodule. Of those examined, 53 were from persons who had either eye lesions or nodules on the head or neck; other 53 were taken at random from persons attending the hospital. The skin released microfilariae in 62 per cent. of the selected and 38 per cent. of the unselected persons. Over the whole group eye lesions occurred in 34 per cent. of those who showed microfilariae and in 23 per cent. of those who did not, a dubious association, as Hawking notes. In the Kakamega district nodules are not conspicuous, but were present in 16 per cent. of microfilaria-positive persons. In these last, eosinophils averaged 15·2 per cent. (49 to 1), in those microfilaria-negative 9·7 (34 to 0), overlapping sufficing to minimize its diagnostic importance in individuals. *C. L.*

HAWKING (F.). [**Onchocerciasis.**] [Correspondence.]—*East African Med. Jl.* 1939. July. Vol. 16. No. 4. pp. 155–156.

RICHET (P.). La volvulose dans un cercle de la haute Côte d'Ivoire. Ses manifestations cutanées et oculaires. [**Onchocerca Infection in the Hills of the Ivory Coast.**]—*Bull. Soc. Path. Exot.* 1939. Mar. 8. Vol. 32. No. 3. pp. 341–355. [41 refs.]

There is a focus of Onchocerca infection in the Tenkodogo circle of Haute-Volta, Ivory Coast, situated on the Greenwich meridian, 11°–13°N. The general question and literature are considered.

C. L.

DUBOIS (A.) & VITALE (S.). Présence de *Microfilaria streptocerca* au Nepoko (Congo Belge). [*Mf. streptocerca* **in Nepoko.**]—*Ann. Soc. Belge de Méd. Trop.* 1938. Dec. 31. Vol. 18. No. 4. pp. 553–556. With 7 figs. on 3 plates.

A focus of infection with *Microfilaria streptocerca* has been found in Betongwe-Medjedje, Belgian Congo, far from the Gold Coast where MACFIE and CORSON discovered and named the worm in 1922, the adult

still being unknown. The presence of the larvae was associated with elephantiasis.

By teasing bits of dermis rich in microfilariae, it was possible to obtain some of them whole. In formol they measured $250\mu \times 4\mu$, and when dried and stained $230\mu \times 3\mu$, they had no sheath, the tail was less narrowed than in *Mf. volvulus* but a little more so than in *Mf. perstans* and often bent into a hook. The nuclei at the head end form a single row, there are four bacilliform nuclei, then 6 to 8 more rounded, and after that there is a double row. The number of nuclei in the tail was not certainly determined, the material being insufficient. The great distance of this place from the Gold Coast is noted.

In 34 persons having elephantiasis of the foot or scrotum a biopsy made by taking a piece of skin from the thigh showed microfilariae in 31 (*O. volvulus* alone in 1, along with *Mf. streptocerca* in 3 or 4, and *Mf. streptocerca* alone in the remainder) ; in 36 lepers from the same chiefdom these were present in 8 only. It may be, it is pointed out, that the presence of microfilariae in the skin is a result of lymph stasis rather than the cause of the condition [see also this *Bulletin*, 1939, Vol. 36, p. 842]. *C. L.*

MAPLESTONE (P. A.) & SUNDAR RAO (S.). **A Case of Gnathostomiasis with Some Interesting Features.**—*Indian Med. Gaz.* 1939. Aug. Vol. 74. No. 8. pp. 479–480.

From the man from whom Maplestone ten years ago removed the first gnathostome reported in man in India [this *Bulletin*, 1930, Vol. 27, p. 984] there is now described the extraction of a second gnathostome.

It was not stated in that abstract that the transient swellings, evidence of the infection, had persisted for 7 years. A year after that extraction, swellings began to reappear at intervals and finally the incision of a blister on the middle finger of the right hand released another gnathostome. Except to come to Calcutta for the second treatment the patient had been continuously in the Jalpaiquri district of Bengal. The second worm, like the first, had 4 rows of spines on the head ; it was slightly larger (5·28 by 0·54 mm. instead of 3·56 by 0·42 mm.), perhaps because it had been better preserved and had not shrunk. The man acknowledged to eating dried raw fish very rarely, which may account for his infection ; but it is felt that, this disease being such a rarity in India, two infections in one man are unlikely ; if so there had been one infection, it had persisted for 17 years, and over the last ten years the worm had undergone no development, the state of development in the second being identical with that in the first. *C. L.*

DAENGSVANG (Svasti). **An Abdominal Tumour caused by** *Gnathostoma spinigerum* **(Owen, 1836).**—*Indian Med. Gaz.* 1939. July. Vol. 74. No. 7. p. 399. With 1 text fig.

An immature female gnathostome formed the nucleus of a tumour consisting of adipose, cellular and fibrous tissue situated in the great omentum below the greater curvature of the stomach in a Siamese woman of 27 who had symptoms of intestinal obstruction. The tumour measured $7 \times 6{\cdot}5 \times 3$ cm. The worm measured 10·8 mm. by 1·04 mm., the cephalic bulb had 8 rows of spines the caudad one rudimentary ; its intestine contained dark red blood. *C. L.*

SAWITZ (Willi). *Trichinella spiralis.* **I. Incidence of Infection in Man, Dogs and Cats in the New Orleans Area as determined in Post-mortem Examinations.**—*Arch. Pathology.* 1939. July. Vol. 28. No. 1. pp. 11–21. With 2 figs. [16 refs.]

Sawitz has already reported on 200 autopsies made in New Orleans to determine the extent of evidence for trichiniasis in them [this *Bulletin*, 1938, Vol. 35, p. 383]. He has now brought the number up to 400 and the present report deals with them all.

" Examination of human diaphragms and pectoral muscles obtained in four hundred routine unselected necropsies disclosed 24 cases of infection with T. spiralis in the New Orleans area—an incidence of 6 per cent. The compressor method detected 2 cases ; the digestion method, 24. Of the 23 cases in which both the diaphragm and the pectoral muscle were available, the diaphragm was found infected in 20 cases, or 87 per cent., and the pectoral muscle in 13 cases, or 56·5 per cent. Surveys in which diaphragms only are examined would thus miss 13 per cent. of the cases. The average number of larvae of T. spiralis found in the diaphragm was 0·35 per gram ; the average number in the pectoral muscle, 0·22 per gram. The diaphragm is, therefore, not only qualitatively but also quantitatively the better tissue for examination. No history of clinical symptoms of trichinosis was found in any of the 24 cases. With increasing age the incidence of trichinella infection increased. The highest incidence was found in negro females (6·66 per cent.) ; the lowest, in white females (5·8 per cent.).

" The incidence of trichinella infections in 300 dogs in the New Orleans area was found to be 1·3 per cent., the incidence in 90 cats was found to be 10 per cent. The incidence in cats is considered to serve as an indicator of the endemicity of trichinella infection in an area."

C. L.

TANG (C. C.). **Trichinella Infection in Rats in Fukien.**—*Chinese Med. Jl.* 1939. June. Vol. 55. No. 6. pp. 537–541. With 4 figs. [10 refs.]

In the Foochow area the author discovered no trichiniasis in 114 rats examined by compression of the diaphragm. Within the city wall of Sa-Hsien cysts were present in 2·19 per cent. of 136 rats, more than 50 cysts having been counted in one diaphragm. Examinations of hog diaphragms are being made. *C. L.*

FAILMEZGER (Theodore R.) & SPALDING (Janet E.). **Diagnosis of Trichinosis.**—*Amer. Jl. Dis. Children.* 1939. July. Vol. 58. No. 1. pp. 129–130.

Three of a family of six children showed Trichinella larvae in their venous blood.

The symptoms of all three came on at the same time and were typical. The blood was obtained from the antecubital vein, 10 cc. being withdrawn, " mixed with 25 cc. of a 2 per cent. solution of acetic acid and centrifuged thoroughly, and the sediment was examined directly by smears stained with Wright's stain." During the twelve days following the first examinations the percentage of eosinophils increased respectively from 36 to 51, 13 to 41 and 11 to 30. The intradermal tests done on two occasions were negative in all ; precipitin tests were positive in two, negative in one. *C. L.*

EVERS (Lorance B.). **Manifestations of Trichiniasis in the Central Nervous System. Report of a Case with Larvae in the Spinal Fluid.** —*Arch. Intern. Med.* 1939. May. Vol. 63. No. 5. pp. 949–956. With 1 fig. [31 refs.]

The author sums up as follows :—

"A case of trichiniasis which presented a clinical picture of toxic encephalitis and neuroretinitis, with subsequent recovery, is reported. Motile larvae were isolated from the spinal fluid after the encephalitic signs had largely disappeared.

"Review of the literature reveals that the presence of larvae in the spinal fluid does not always produce clinical manifestations of involvement of the nervous system. Larvae of *T. spiralis* in the spinal fluid have been reported in 24 cases. Of these, 4 were fatal, a mortality rate of 26·6 per cent.

"From the reported cases it seems probable that careful examination of the spinal fluid in suspected cases of trichiniasis, with or without symptoms of involvement of the central nervous system, may aid in the diagnosis of this disease."

MCNAUGHT (James B.), BEARD (Rodney R.) & DEEDS (Floyd). **Effects of Sulfanilamide, Phenothiazine and Thionol in Experimental Trichinosis.**—*Proc. Soc. Experim. Biol. & Med.* 1939. May. Vol. 41. No. 1. pp. 17–20.

"(1) A rather large amount of sulfanilamide, 0·96 g. per kilo of body weight daily, used over a period of 6 weeks reduced the number of trichinella encysting in the muscles of rats by 55 per cent. (2) The continuous use of phenothiazine, in a dosage approximately one-tenth that of sulfanilamide, over a period of 6 weeks reduced the severity of trichinous infection in rats by 74 per cent. and warrants further experimentation. (3) Thionol is of little use in reducing the severity of trichinous infestation in rats."

OTTO (G. F.) & ABRAMS (Evelyn). **Quantitative Studies on the Effect of Heat on Trichina** (*Trichinella spiralis*) **Larvae.**—*Amer. Jl. Hyg.* 1939. May. Vol. 29. No. 3. Sect. D. pp. 115–120.

The experiments confirm those of RANSOM and SCHWARTZ (*Jl. Agric. Res.*, 1919, Vol. 42, p. 201) that 55°C. is the lowest temperature that will destroy trichinella larvae. This knowledge cannot be used to raise by diathermy a host's temperature to the degree lethal to larvae; the rat hosts died, the larvae survived. *C. L.*

JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. 1939. Apr. 29. Vol. 112. No. 17. p. 1751.—**Incidence of Trichinosis.** [Queries and Minor Notes.]

BLEYER writes to the editor that in the issue of the *Fränkische Tageszeitung* of 29th January, 1939, it is stated that 17 millions of Americans suffer from trichiniasis and that the paper continues "Nothing is done to protect the people, but, nevertheless, they build skyscrapers." A long editorial note gives the position as has from time to time been noted in this *Bulletin*, and as regards the efficacy of methods of meat inspection reminds us that STILES, after two years of observation in 1898 of the German method of food inspection concluded that of the 6,329 cases of trichinosis which were detected in Germany between 1881 and 1898, 3,388 cases with 132 deaths appeared to be due to faults of the method of German food inspection.

C. L.

DINNIK (N. N.). Indépendance des espèces *Trichocephalus trichiurus* (L. 1771) et *Trichocephalus suis* (Schrank, 1788). [**Independence of** *Trichuris trichiura* **and** *T. suis*.]—*Med. Parasit. & Parasitic Dis.* Moscow. 1938. Vol. 7. No. 6. [In Russian pp. 907–917. With 2 figs. [11 refs.] French summary p. 918.]

On the grounds of slight difference in mean measurements of young and adult forms, of time of development and of numbers of chromosomes these forms are held to be specifically distinct. *T. trichiura* and *T. suis* are dealt with in that order below. Eggs in microns, length 57·75 and 62·6, width 26·83 and 29·55; infective larval length in microns 126 to 148 and 150 to 165; spicule, length in millimetres 2·9 to 3·4 and 1·9 to 2·5; number of chromosomes 4 and 6; development to infectivity, more rapid and less rapid. *C. L.*

DINNIK (J. A.) & DINNIK (N. N.). Observations sur le développement des oeufs du *Trichocephalus trichiurus* (L) dans le sol. [**Development of Trichuris Eggs in Soil.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1939. Vol. 8. No. 2. [In Russian pp. 221–228. French summary p. 228.]

The time taken for the development to infectivity of Trichuris eggs buried in soil has varied between 24 and 40 days with the site, whether sunny or not, and with the depth of burial; and at the same mean temperature the rates seem to be the same in water or in soil.

C. L.

BERIBERI.

PRÉCIS OF ABSTRACTS IN THIS SECTION.

MONTEIRO (p. 311) describes "shoshin," a symptom complex of acute cardiac failure which occurs in beriberi. It is a medical emergency but usually responds quickly to injections of vitamin B_1. SEIN (p. 311) also describes acute cardiac beriberi and the success which follows energetic vitamin therapy. KUO (p. 312) discusses the cardiovascular manifestations of beriberi and describes the vitamin B_1 treatment given.

WEGELIUS (p. 312) reports a case of avitaminosis with symptoms of beriberi and pellagra. LEHMANN and NIELSEN (p. 313) describe a patient, living on an inadequate diet, who had flaccid paralysis which they attributed to beriberi. On treatment with vitamin B_1 pellagra supervened but under treatment with B_1 and B_2 all symptoms disappeared. LOEB and GREENBAUM (p. 314) report a patient with beriberi from inanition following intestinal operations. In comment the reviewer points out that the diagnosis of beriberi in these two cases may be open to question.

GUIANG (p. 314) warns against the indiscriminate and exclusive use of vitamin B_1 in pure form in the treatment of beriberi. MATA (p. 314) shows the value of thiamin chloride (synthetic vitamin B_1) in beriberi, especially in the infantile form which had not been prevented by tikitiki given from birth.

YOUNG (p. 315) describes beriberi in a woman whose diet consisted of milk chocolate and grapes only; paresis developed but symptoms

improved rapidly on a normal diet. JONES and BRAMWELL (p. 315) record a case of beriberi in a man with a history of alcoholism and gross dietary deficiency.

PANNEKOEK-WESTENBURG and VAN VEEN (p. 315) give a list of the foods containing vitamin B_1 (estimated by Harris's bradycardia method) and grouped according to their richness in this vitamin.

C. W.

MONTEIRO (E. S.). **Cardiac Beri-Beri. A Medical Emergency.**—*Jl. Malaya Branch Brit. Med. Assoc.* 1939. Sept. Vol. 3. No. 2. pp. 177–183.

" Shoshin " is the name given to an acute cardiac condition occurring in beriberi, so acute that it is really a medical emergency. It is not seen in those patients in whom nerve symptoms develop early because the latter necessitate complete rest. The symptoms are of comparatively sudden onset with distressing dyspnoea ; the patients are intensely restless, with violent palpitations, praecordial discomfort to agonizing pain, and they toss from side to side without relief ; respiration is frequent and shallow, the expression is one of anxiety, pupils are dilated, liver enlarged and tender, a wave-like motion may be visible over the heart. The pulse becomes smaller and smaller, the veins dilate, and the patient dies, if untreated, with intense dyspnoea but usually retains consciousness to the last.

Vitamin B_1 in appropriate dosage brings speedy cure. It is given intravenously or intramuscularly, the initial dose being 3,000–5,000 I.U. If there is much overdistension of the right side of the heart with cyanosis bleeding may do good, but in many the anaemia is of such degree and the blood-pressure so low that venesection is not done. As a rule diuresis comes on 24–36 hours after the vitamin is given, but occasionally there is continued anuria and death takes place with symptoms of uraemia. For such patients the author recommends calc. chloride gr. 15, glucose 1 dr., water 1 oz. thrice daily, and 2 cc. injections intramuscularly of salyrgan. These cases are usually in patients with so marked a fall of blood-pressure that the kidneys fail to function. One or two ounces only of urine may be passed in 24 hours and this contains granular and hyaline casts and much albumen, and the blood urea may be as high as 350 mgm. per cent. *H. H. S.*

SEIN (Min). **Clinical Notes on the Treatment of Acute Cardiac Beri-Beri.**—*Indian Med. Gaz.* 1939. June. Vol. 74. No. 6. pp. 344–347.

The author rightly calls attention to the likelihood of acute cardiac types of beriberi being overlooked in places where the great majority of cases are of the chronic forms, and also to the fact that such acute types may suddenly arise in the course of the disease even when the patient is under treatment by dietetic measures. The picture presented is that of acute dilatation and heart failure—marked orthopnoea, cyanosis, restlessness and oedema. If the condition is left untreated death soon occurs, usually within 72 hours. If, however, a certain line of treatment is adopted, the prognosis is vastly improved. Details are given of five patients in whom the diagnosis was made promptly and treatment started at once and all five recovered. The treatment adopted with such success was on the following lines. A large initial dose of vitamin B, 3,000 units of Betaxin, is given intravenously in 10 cc. of hypertonic glucose solution (in one instance the

intravenous route was not feasible and 8,000 units were given intramuscularly instead) and oxygen was administered continuously. Relief soon is observed and the change for the better almost dramatic. Thereafter, " till discharge," that is usually 10–12 days, the patient receives injections of 1,000 units of Betaxin and 1/60 grain strychnine daily. The author states that the site of the initial dose of Betaxin was decided arbitrarily and the intravenous route because of the certainty of absorption and rapidity of action ; strychnine is given as a routine for its tonic action on the muscles. *H. H. S.*

KUO (P. T.). Cardiovascular Manifestations of Beriberi. [**Cardio-vascular Manifestations of Beriberi.**]—*Chinese Med. Jl.* 1939. May. Vol. 55. No. 5. pp. 427–438. With 6 charts. [20 refs.]

This paper was presented at a medical conference at Shanghai at the end of 1938 and, like most conference papers, reviews the past rather than brings forward any new facts. Beriberi is a common disease among the Chinese in Shanghai. Of 760 admissions to St. Luke's Hospital in the latter part of the year 15 per cent. were admitted with the diagnosis of beriberi, whereas if the number includes patients with beriberi but suffering from, or admitted for, other complaints, the total is raised to fourfold and nearly all presented cardiovascular involvement in some degree. Nearly two-thirds (60 per cent.) were between 15 and 30 years of age. The clinical manifestations included pericardial effusion, tachycardia, syncope, hypotension, right-sided failure, etc.

As regards treatment the indications followed were to give vitamin B_1 10 I.U. for each 100 calories of food intake or approximately 300 units daily, given to cardio-vascular patients as a concentrate intravenously or, to those less acutely ill, intramuscularly. If there was marked oedema dehydration was attempted with magnesium sulphate and, to some, glucose concentrated (50 per cent.) intravenously with the vitamin. Digitalis, even in large doses, was found ineffectual, a fact in accordance with general experience in these cases. *H. H. S.*

CASTELLANI (Aldo). **Pellagroid Beriberi. (Dermo-Beriberi.)**—*Jl. Trop. Med. & Hyg.* 1938. Sept. 15. Vol. 41. No. 18. pp. 294–295. With 3 figs.

A short article referring to the occurrence of pluri-avitaminoses and more especially to those cases exhibiting mild symptoms of pellagra together with signs of peripheral neuritis.

The author suggests the term pellagroid beriberi or dermo-beriberi and gives as synonyms : pellagroid xerodermic beriberi, the beriberi pellagra phrynoderma syndrome, etc. [Most of these terms seem to be open to objections. When shall we have in this country some representative body to determine medical nomenclature !] *H. S. Stannus.*

WEGELIUS (Ruth). Fall av B-avitaminos. [**A Case of B-Avitaminosis.**] —*Nordisk Med.* 1939. Oct. 28. Vol. 4. No. 43. pp. 3208–3210. With 1 chart. German summary.

The patient gave a history of intestinal disturbance dating back several years. The symptoms of beriberi were oedema, tachycardia, enlargement of the heart to the right and polyneuritis ; those of

pellagra were typical skin changes, sores at the angles of the mouth, debility and mental changes. Rapid improvement took place under treatment with Ido-B-Granulat and vitamin B_1, but an exacerbation of erythema occurred after 3 weeks which responded to nicotinic acid.

C. W.

LEHMANN (Jørgen) & NIELSEN (Holger E.). **A Case of Beri-beri (followed by Pellagra), verified, and followed during Improvement, by Analyses of Vitamin B_1 in the Blood.**—*Acta Med. Scandinavica.* 1939. Vol. 99. No. 6. pp. 577–586. With 5 figs.

A 28-year-old woman, one of a family of 11, all the others being healthy, was admitted to hospital with bilateral symmetrical flaccid paralysis of the legs and loss of cutaneous and tendon reflexes which had developed gradually during the previous six months. The legs were swollen but there was no oedema [presumably no pitting on pressure]; there was some sensory loss but no very definite determination was possible owing to mental dullness associated with blindness due to bilateral keratomalacia at 8 months of age.

Except for some general muscular weakness there was nothing else to note; radiographic and cardiographic investigations of the heart showed nothing abnormal; blood, urine and cerebrospinal fluid normal; Wassermann reaction negative.

In view of the dietetic history in the case an avitaminosis B_1 was diagnosed. The woman had for a long period subsisted on a little tea and coffee, sweet soup, a sweet, some biscuits, white bread and paste.

Using Meiklejohn's modification of Schopfer's test [*Biochem. Jl.* 1937, Vol. 31, p. 1441] for estimation of B_1 in blood [average in health= 0·09 gamma per cc.] a value of 0·01 was found. Treatment was begun with 2,000 international units "Ido" B_1 injected daily for the first four weeks then every second day for three weeks and twice weekly for two weeks. Improvement was noted after the first week and in a month the patient could walk a little with support.

The vitamin B_1 blood content rose to 0·10. Other symptoms then supervened, the patient became emotional with some mental change, diarrhoea ensued and typical pellagrous changes in the skin of the hands were noted, consisting of yellowish brown pigmentation and hyperkeratosis, localized especially about the knuckles and interphalangeal joints. The tongue was red and a test-meal, which on admission had shown a normal acid, now demonstrated an achylia.

The treatment by large doses of vitamin B_1 was stopped and in place a tablespoonful of "Ido" B granulate (containing 50 units B_1 and 25 units B_2 per gram) was given thrice daily. This was followed by rapid improvement and all signs had disappeared in a month. The authors believe that the pellagrous symptoms developed in consequence of the exhibition of the large doses (100,000 units in two months) of vitamin B_1 and that the case goes to prove the existence of an antagonism between vitamin B_1 and the pellagra preventing factor, some such part antagonism having been demonstrated in animals. [The observation is a very interesting one and very suggestive but the implications should be received with reserve until much more knowledge has accumulated. Many conditions, with a flaccid paralysis of the lower limbs as the prominent symptom, have been recorded in which good results have followed the exhibition of vitamin B_1 but it seems a little premature to label them beriberi.] *H. S. Stannus.*

laboratory. It is common knowledge that the vitamin B_1 content varies greatly with the way in which food is prepared, as in rice polishing and prolonged heating; cassava leaves, raw or steamed, are rich in this vitamin, but lose half the content in cooking; leguminous seeds are another instance. The authors present a synopsis of their findings under three heads:—

"I. *Materials so rich in B_1 that, by being added to or mixed with products that contain little B_1 they can form a food that warrants a sufficient supply.*—Such products must have a B_1 content of at least 1 unit per gramme, To these belong: husked rice (Oryza sativa), parboiled rice, ricebran, polishings of great millet (Andropogon Sorghum), cassava leaves (Manihot utilissima), peanuts (Arachis hypogea), bungkil katyang tanah (peanut-presscake), ontyom (prepared by means of fungi from peanut-presscake) and most of the seeds of Leguminosae.

"II. *Foodstuffs that themselves contain a sufficient quantity of B_1 to warrant a sufficient B_1 supply if partaken of in proper, not too small quantities, but that do not contain sufficient to complement other food that is deficient in B_1.*—These contain 30–60 units per 100 gm. To these belong: partly polished rice, Indian corn (Zea mays), great millet (Andropogon Sorghum), fresh "sweet" cassava (Manihot utilissima), dyenki (dried cassava skin), sweet potato (Ipomoea batatas), potato (Solanum tuberosum)

"III. *Foodstuffs containing only little B_1.*—These contain less than 30 units per 100 gm. To these belong: polished rice, ketan (glutinous rice, Oryza sativa forma glutinosa), getuk cassava (prepared from dry cassava-root), gaplek (dried cassava), gaplek flour, white bread, cow's milk, soya milk." *H. H. S.*

Printed under the authority of His Majesty's Stationery Office
by the South Essex Recorders, Ltd., Ilford.

(302) Wt. P2975/238 1875 4/40 S.E.R. Ltd. Gp. 432.

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